The Description of a New Species of South American Hocicudo, or Long-Nose Mouse, Genus *Oxymycterus* (Sigmodontinae, Muroidea), with a Critical Review of the Generic Content

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Abstract

The description of a new species of *Oxymycterus* entailed a review of the entire genus but without arriving at a definitive taxonomic revision. The many outstanding problems such as the complex dental morphology of the unworn molars, the function of the trumpet-shaped snout, the elongate front claws, and the origin, affinities, and biogeography of the genus, and of sigmodontines in general, could not be addressed within the limitations of current knowledge and available material. The size relationships of the 23 described forms are indicated in terms of size classes, from small to large. They are separated into two coordinate geographic groups, one Atlantic, the other Andean, both confined to between the south bank of the Rio Amazonas–Solimões–Marañón system and the north bank of the Rio Paraná system, with absence of hocicudos in the floodlands between. Each originally named taxon is listed with type data, including original measurements, putative geographic distribution, relevant taxonomic information, and some comparisons. What is known of habits and habitats is summarized. Notions of oxymycterine burrowing are dispelled, and generally accepted interpretations of supposed sigmodontine origins and dispersal are questioned.

Introduction

The following description of a new mouse of the genus *Oxymycterus* discovered in the lower basin of the Rio Amazonas in Brazil required a review of the genus and organization of the 23 forms described since the first by Felix Azara in 1801. Available material is inadequate for a definitive taxonomic revision, 18 of the 23 holotypes being in European museums, 11 of them known only from their types, and 2 without types. Nevertheless, specimens at hand suffice for attainment of immediate objectives and organization of most of the accumulated data. Geographic boundaries of the genus (map, Fig. 1) are extrapolated from type localities (map, Fig. 2) and marginal localities. Delineation of the range of each species, however, awaits taxonomic revisions based on direct comparison of all holotypes or acceptable representatives. For the present, published measurements of types and topotypes or near topotypes form the primary basis for arrangement of the material into size classes each with the appearance of a species or species-group. Recognized are three Atlantic Division size classes and three Andean Division size classes with no distinguishable intermediates.

Abbreviations

The following abbreviations are used for institutions and terminology.

FMNH = Field Museum of Natural History, Chicago
MNR = Museu Nacional de Brasil, Rio de Janeiro
MPEG = Museu Paraense Emilio Goeldi, Belém
MVZ = Museum of Vertebrate Zoology, University of California, Berkeley

RNHMS = Rijkmuseum Van Natuurlijke Historie, Stockholm
USNM = National Museum of Natural History, Smithsonian Institution, Washington, D.C.
USPMZ = Universidade de São Paulo Museu de Zoologia, São Paulo

CB = condylobasal length of skull
CU = hind foot with claw
E = ear from notch
GSL = greatest skull length
HB = length of head and body combined
HF = hind foot length, with claw (cu) or without claw (su)
IB = interorbital width
ML = alveolar length of upper molar row
SU = hind foot length without claw
T = tail length
ZB = zygomatic breadth

Genus *Oxymycterus* Waterhouse

Oxymycterus Waterhouse, 1837:21—subgenus of *Mus*. Tomes, 1861:285—genus. Tullberg, 1899—muroid and *Oxymycterus* anatomy; phylogeny. Thomas, 1909:236—characters; species. Tate, 1932b:616—taxonomic history; species. Gyldenstolpe, 1932: 128—characters. Ellerman, 1941:8, 26, 317, 330, 367, 419, 420—characters; classification; species. Cabrera, 1961:465—catalog. Hooper and Musser, 1964:28—glans penis morphology; muroid classification. Carleton, 1973:15, 24, 25—stomach morphology; relationships. Vorontsov, 1979—alimentary system (morphology; function; comparisons). Reig, 1987:360—tribe Akodontini (definition; generic affinities; species). Musser and Carleton, 1993: 726—check list; taxonomic comments.
Oxymicterus [sic], Tomes, 1861:285—generic rank.

TYPE SPECIES—*Mus nasutus* Waterhouse, by original designation.

Geographic Distribution (maps, Figs. 1, 2)

Hocicudos are confined to the middle latitudes of South America south of the Rio Amazonas–Solimões–Marañón in Brazil and Peru. Eastward the range extends along the Atlantic coast of Brazil, Uruguay, the Province of Buenos Aires, Argentina, thence west along the northern side of the Río Paraná basin of Brazil, Argentina, Paraguay, Bolivia, and the northeastern or Amazonian versa of the Bolivian and Peruvian Andes to elevatio of 4000 m or more.

Oxymycterus is unknown in the Amazonian ra forest or floodlands between the Rio Tocantir or perhaps the more eastern Rio Guripí, to t eastern versant of the Andes. Excepted are inf trations of the lower reaches of the Rios Tocantir Xingú, Tapajóz and Madeira in Brazil, and hea waters of the Río Madeira in Bolivia and Braz The genus is unknown north or west of the R Amazonas–Solimões–Marañón.

Characters

External

The 23 described forms of *Oxymycterus* ran in size from about that of a large domestic mou (*Mus musculus*) to that of a large domestic r (*Rattus rattus*); tail from shorter (60%) to near as long as head and body combined, thinly hirsut the coarse annularly arranged scales not conceale hind foot long, stout, longer than ear measure from notch; heel hairy, sole with 6 pads, clav long, thin, the manual as long or longer than th pedal; the middle manual claw longest and abo equal to combined length of corresponding ph langes; manual digit V with weak claw extendi to slightly beyond base of IV, claw of I hard extending beyond carpals; ears and eyes not mar edly reduced; snout long, mobile, apparent adapted for rooting; general coloration agouti dominantly brownish, blackish, reddish, orange mottled, grayish hair bases often showing throug on underparts, or may dominate; mammary fo mulae 2–1 = 6 or 2–2 = 8.

Cranial (Figs. 12, 13, 15, 16, 18, 19, 21)

Skull long, narrow; combined premaxillaries ar nasal bones often produced in front of incisors an expanded tube or trumpet; nasals parallel-side to tapered behind, tips squared, length approx mately 40% that of skull and increasing with ag cartilaginous septum of snout (*os rostri*) protru ing; infraorbital foramina widely open; anteri zygomatic plate narrow, markedly reclined ar little or not visible viewed from above; zygomat

FIG. 1. Geographic distribution of the genus *Oxymycterus* Waterhouse, an approximation based on type localities and marginal records.

FIG. 2. Type localities of all described species and subspecies of the genus *Oxymycterus*.

arches slender, nearly parallel-sided or convergent anteriorly; braincase moderately inflated; interparietal bone greatly reduced or obsolete; supraorbital borders may be rounded or square, more or less ridged or smooth; occipital bone often ridged, sometimes crested; palatal or incisive foramina well open, produced back to about level of anterior third of first molar; palatal bridge broad, produced posteriorly from slightly in front to slightly behind posterior plane of last molars; mesopterygoid fossa wide, parapterygoid fossae narrower and shallow; bullae moderately inflated; braincase smooth, rounded, square, or with low temporal ridges that accentuate with age; molar rows parallel-sided to convergent posteriorly; mandible low, the angle lower than long.

Os Rostri or Prenasal Ossification (Figs. 15, 16A, 19A)

A short bony or cartilaginous protrusion up to 2 mm in length rounds off the combined nasal bone tip in some sigmodontines. Hinojosa et al. (1987, p. 5, Fig. 7A) called attention to this feature in *Oxymycterus* and noted it in the photograph of a *Blarinomys* skull published by Matson and Abravaya (1977). A spot check of the sigmodontines in the Field Museum collection revealed a low number, from less than 1% to not more than 2%, in skulls of *Abrothrix longipilis, Akodon kofordi, Oryzomys* (*Sigmodontomys*) *alfari, Oryzomys palustris, Peromyscus yucatanicus,* and *Neotoma cinerea* among others cursorily examined. A functional relationship between presence of the ossification and shape, length, or any other modification of the rostrum is not evident. My impression is that the ossification may be more prevalent than where noted had it not been shorn during the skull cleaning process, perhaps because it seemed to be an adventitious growth.

The function of the os rostri is unknown. It likely supports the soft tissue at the end of the snout. In *Oxymycterus* it may be related to rooting, but this may not be true of other taxa not known to root.

In the Suidae with snout highly developed for rooting, the os rostri, an extension of the nasal septum, supports the fleshy outer tissue between the nostrils.

Dental (Figs. 3, 4, 12, 14, 16–21)

Upper incisors opisthodont, moderately heavy; molars tetralophodont, hypsodont, inner and outer cusps slightly oblique, the unworn outer cusps high, pointed, the inner terraced; procingulum (loph I) of m^1 narrower than loph II (measured across protocone–paracone), anteromedian flexus present, the anterolabial and anterolingual conules subequal; m^3 one-half or less bulk m^2; paralophule and mesoloph present in unworn m^1 but usually fused, sometimes present in m^2; moderately worn

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Key to type localities of nominate species, Figure 2:

1. Fordlândia, Rio Tapajóz, Pará, Brazil, 3°40′S, 55°30′W, near sea level (*amazonicus*).
2. São Lourenço da Mata, Pernambuco, Brazil, 8°00′S, 35°03′W, sea level (*angularis*).
3. Bahia (= Salvador), Bahia, Brazil, 12°59′S, 38°31′W, sea level (*hispidus*; *rostellatus*).
4. Rio Mucurí, Bahia, Brazil, 18°05′S, 39°34′W, sea level (*dasytrichus*).
5. Paranahyba, Rio Jordão, Minas Gerais, Brazil, 18°26′S, 48°00′W, 700–900 m (*roberti*).
6. Roça Nova, Serra do Mar, Paraná, Brazil, 25°30′S, 48°50′W, 1000 m (*quaestor*).
7. Joinville, Santa Catarina, Brazil, 26°18′S, 48°50′W, sea level (*judex*).
8. Taquara do Mundo Novo, Rio dos Linos (sic, = Sinos), Rio Grande do Sul, Brazil, 29°39′S, 50°47′W, 29 m (*iheringi*).
9. Maldonado, Uruguay, 34°54′S, 54°57′W, sea level (*nasutus*).
10. Ensenada, La Plata, Buenos Aires, Argentina, 34°51′S, 57°55′W (*platensis*).
11. Entre Rios, Argentina, "32°30′S" (*rufus*).
12. Río Parana-í, near Caraguatay, Misiones, Argentina, 26°37′S, 54°46′W, 100 m (*misionalis*).
13. Sapucay, Paraguay, 25°40′S, 56°55′W, 220 m (*delator*).
14. Higuerilla, Valle Grande, Jujuy, Argentina, 23°35′S, 65°15′W, 2000 m (*akodontius*).
15. Caraparí, Yacuiba, Tarija, Bolivia, 21°49′S, 63°46′W (*jacentior*).
16. Comarapa, 28 km W, Cochabamba, Bolivia, 17°51′S, 64°40′W, 2800 m (*hucucha*).
17. Choquecamate, Río Securé, Cochabamba, Bolivia, 16°55′S, 66°37′W, 4000 m (*paramensis*).
18. Charuplaya, upper Río Securé, upper Río Mamoré, Cochabamba, Bolivia, 15°48′S, 66°30′W, 1350 m (*doris*).
19. Inca Mines, Santo Domingo, upper Río Inambari, Puno, Peru, 15°30′S, 70°08′W, 1875 m (*juliacae*).
20. Yanahuaya, 14 km W, Puno, Peru, 14°19′S, 69°21′W, 2210 m (*hiska*).
21. Limbani, Puno, Peru, 14°08′S, 69°42′W, 2810 m (*nigrifrons*).
22. Perené, Junín, Peru, 10°58′S, 75°13′W, 800 m (*inca*).
23. San Ernesto, Mapiri, upper Río Beni, La Paz, Bolivia, 10°23′S, 65°24′W, 1000 m (*iris*).

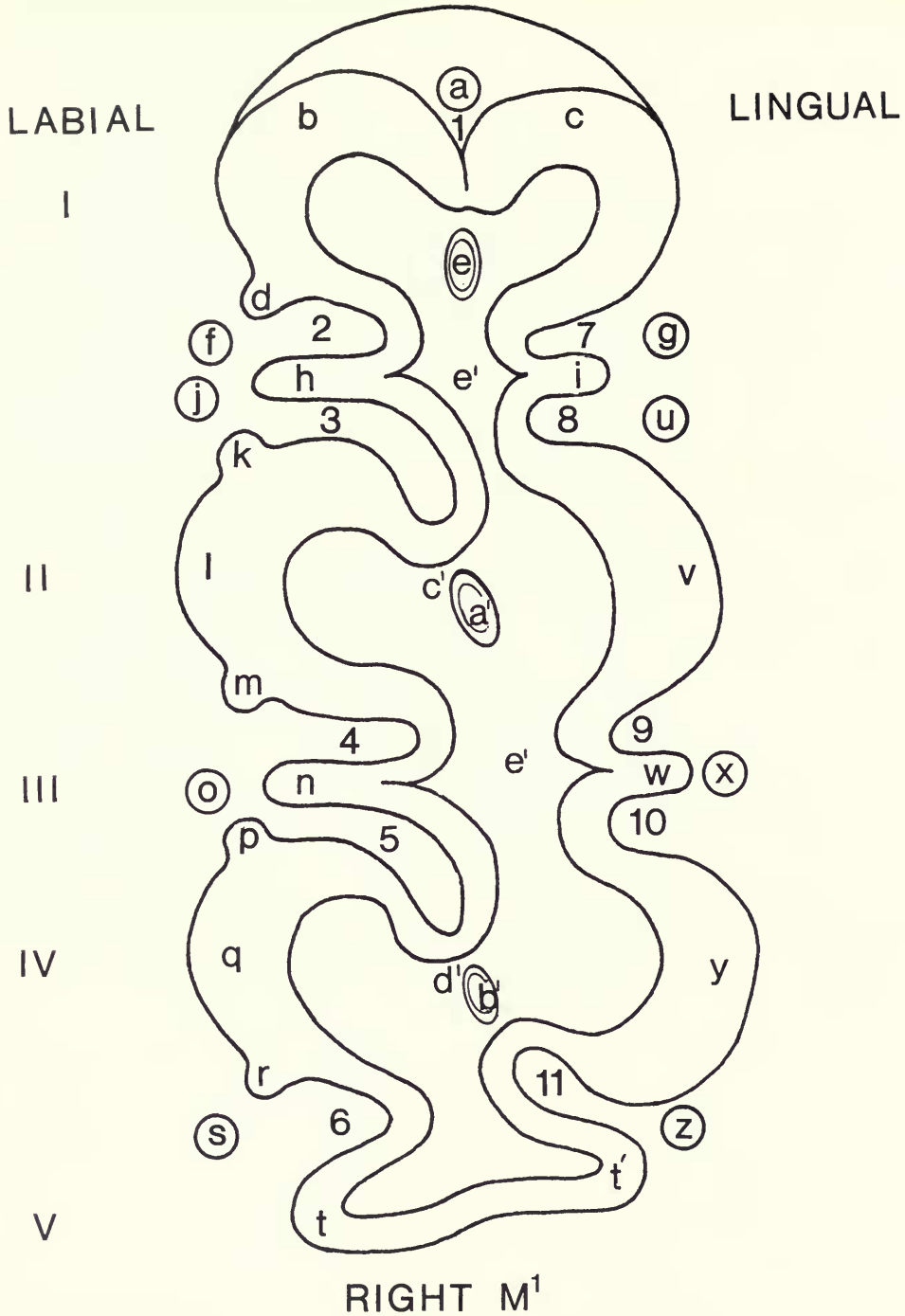

FIG. 3. Diagram of occlusal surface of a first right upper molar showing elements of the enamel pattern in all sigmodontine upper molars. Figure copied from Hershkovitz (1993, p. 12).

crowns of m^{1-3} dished, 8-shaped, the lophules eroded; mesolophid, if present, often fused with mesostylid, if present.

Remarks

The fully formed crowns of unworn molars of *Oxymycterus* display sharply each element of the akodontine molar. By the time the last molar has become fully functional, however, the particularly thin crown enamel of the first 2 teeth has mostly if not entirely been eroded, leaving the dentine fully exposed to the grinding, crushing forces of mastication. Without the enamel cover, the once high, pointed cusps are quickly flattened, lophs and lophids reduced to stubs, styles (ids) disappear, flexi (ids) become faintly outlined or reduced to mere indentations on the outer molar walls, and some may have an ephemeral existence as enamel islands of the crown.

Adult molar crowns of all species become shallow basins, the first trilaminar, the second 8-shaped, the third even further reduced. Except for size, adult molars seem to have lost taxonomic character.

All structural details of the unworn (ancestral?) *Oxymycterus* molars present at the eruptive stage are present in the diagramatic representation of upper and lower first molars (Figs. 3, 4). Molars 2 and 3 show fewer, less well defined elements.

A few typographical and accidental errors in the original diagrams (Hershkovitz, 1993) reproduced here have been eliminated.

Stomach

New World cricetine stomachs are of the two morphological types defined by Carleton (1973, p. 10). The primitive *unilocular–hemiglandular type* (Fig. 5A) is single-chambered with a shallow incisura angularis. The derived *bilocular–discoglandular type* (Fig. 5B) differs primarily by the deep incisura angularis that gives the bipartite appearance to the stomach.

Of the 27 stomachs of representatives of South American sigmodontine genera investigated (17 figured) by Carleton, those of 20 conform to the basic unilocular–hemiglandular pattern. Noteworthy is the stomach of *Oxymycterus* with the glandular epithelium confined to a diverticulum located on the greater curvature (Fig. 6). A minute aperture connects this glandular pouch with the lumen of the stomach. The diameter of the opening measured .35 mm in the specimen of *O. pla-*

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Explanation of symbols, Figure 3. Note: a–i inclusive = procingulum or loph I; s, t, t′, z = postcingulum or loph V.

I–V. lophs of pentalophodont molars.
a. anteromedian style (may be fused with b, c, or both).
b. anterolabial lophule.
c. anterolingual lophule.
d. anterolophule (may be fused with f).
e. anterior fossette.
f. plesiostyle (may be fused with d, h, or j).
g. protostyle (may be fused with i).
h. anteroloph (may be fused with f, j, or both).
i. protoloph (may be fused with g, u, or both).
j. parastyle (may be fused with f, h, k, or a combination).
k. mesolophule (may be fused with h, j, or both).
l. paracone.
m. paralophule (may be fused with n, o, or both); element may be multiplied.
n. mesoloph (when fused with o = mesolophostyle).
o. mesostyle (may be fused with m, p, or both; when fused with n = mesolophostyle of pentalophodont molar).
p. metalophule (may be fused with o, n, or both).
q. metacone.
r. posterolophule (may be fused with s).
s. posterostyle (may be fused with r, t, or both).
t. posteroloph (may be fused with s).
t′. posteroconule (may be fused with z, usually not differentiated from posteroloph, t).
u. protolophostyle (may be fused with i).
v. protocone.
w. enteroloph (may be fused with x).
x. enterostyle (may be fused with w).
y. hypocone.
z. distostyle.
a′. median fossette (may be coalesced with 3, or united with 4).
b′. posterior fossette (may be coalesced with 5, or united with 6).
c′. protolophule.
d′. hypolophule.
e′. mure (border between lingual and labial cusps and lophs).
1. preflexus (anterior median fold).
2. anteroflexus (anterior secondary fold).
3. paraflexus (first primary fold).
4. mesoflexus (first secondary fold).
5. metaflexus (in absence of mesoloph [n] coalesced with first secondary fold [4]).
6. posteroflexus (second secondary fold).
7. supraflexus (anterior lingual fold; in absence of protoloph coalesced with first minor fold [8]).
8. protoflexus (first minor fold).
9. entoflexus (major fold).
10. hypoflexus (in absence of enteroloph coalesced with major fold [9]).
11. distoflexus (second minor fold).

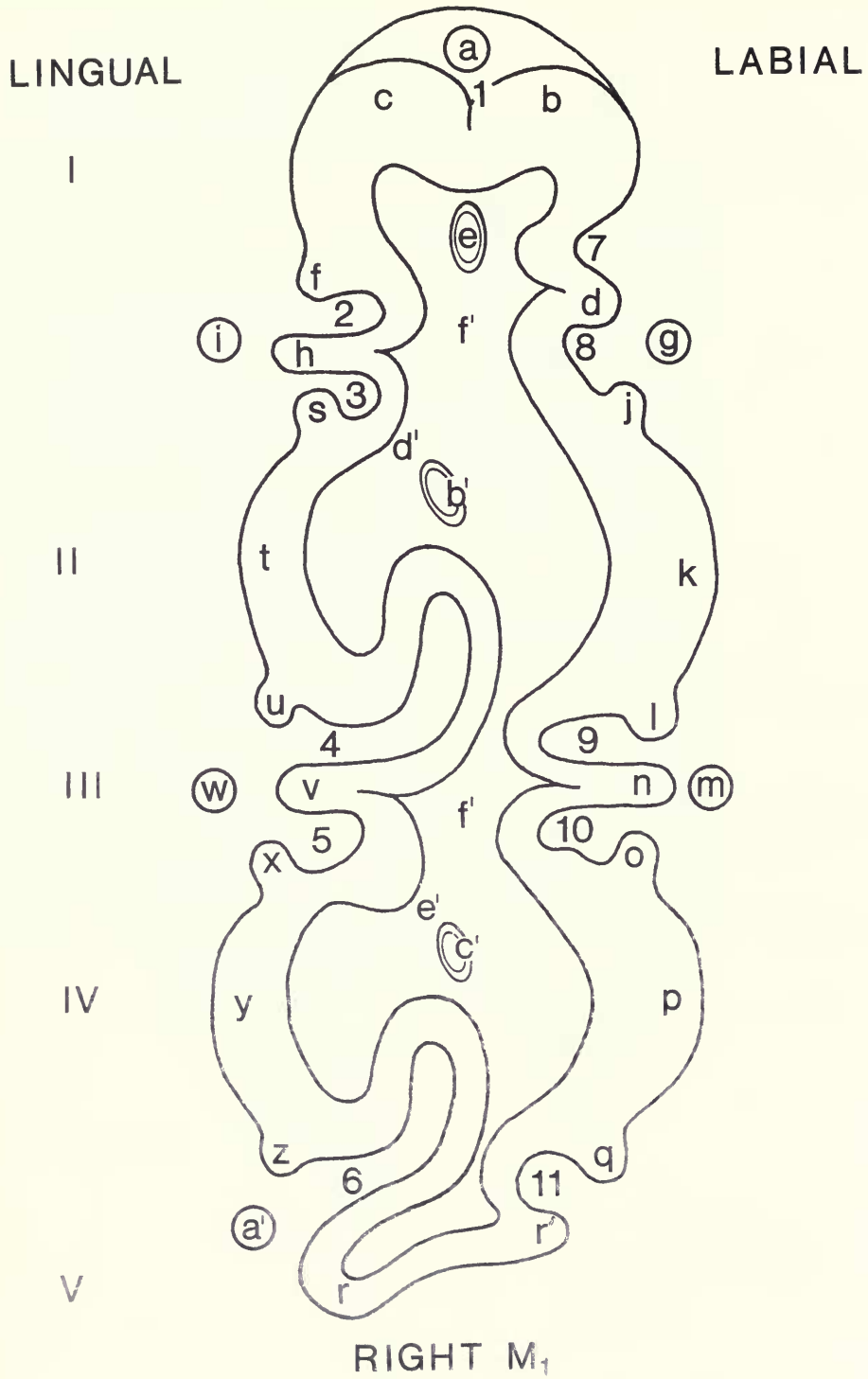

FIG. 4. Diagram of occlusal surface of a first right lower molar showing elements of the enamel pattern in all sigmodontine lower molars. Figure copied from Hershkovitz (1993, p. 16).

tensis and .35 mm and .50 mm in examples of *O. rutilans* (= *O. rufus*). Data are from Carleton (1973, p. 15). The bilocular–discoglandular type stomach of *Peromyscus mexicanus* is also characterized by a similar pouched stomach with the glandular epithelium confined to the diverticulum. Its gastric secretion is discharged to the lumen through a tiny aperture (Fig. 6).

The presence of a pouched diverticulum in a muroid stomach was first noted by Tullberg (1899, p. 249) in an adult female *Oxymycterus rufus*. Her stomach measured 40 mm; small intestine, 190 mm; large intestine, 110 mm; caecum, 25 mm; inner surface of stomach entirely covered with stratum corneum; glands concentrated around the great curvature of the stomach wall formed the pocket, which opened into the lumen through the miniscule aperture. The diverticulum surrounded by the glandular epithelium is figured by Tullberg (1899, Pl. XLI, Figs. 23, 24).

The pouched stomach of a specimen of *Oxymycterus nasutus* was described and compared by Vorontsov (1979, p. 184) with that of the pouched North American grasshopper mouse *Onychomys* with a bilocular–discoglandular type stomach. It is described as

> sacciform, fornix ventriculi . . . not marked and the main stomach-chamber . . . lined from esophagus to duodenum with corneous epithelium of esophageal origin. At the base, opposite to the opening between the esophagus and the stomach, there is a small aperture leading into an isolated chamber, the glandular diverticulum. The entire wall of the diverticulum is lined with considerably high fundic glands. The aperture of the diverticulum (as distinct from that of *Onychomys*) is on the left edge of its upper wall and is surrounded by a circular system of muscles forming a sphincter. As in *Onychomys*, the diverticulum of *Oxymycterus* presents a gigantic gland in which gastric juice is produced. This juice is periodically supplied to the corneous portion by opening the sphincter. Here the juice breaks down the proteins.
>
> Unlike *Onychomys*, the pyloric portion in *Oxymycterus* does not have any special corneous prominence for grinding the chitinous residue of insects and is not separated from the remaining part of the stomach. The pyloric sphincter muscles are not so prominent as in *Onychomys*.

The microscopic anatomy of the stomach of *Oxymycterus rutilans* (= *O. rufus*) was studied by Echave Llanos and A. Vilchez (1964, p. 187).

Glans Penis (Figs. 7, 8)

The glandes penes of *Oxymycterus paramensis* and *O. rufus* have been described by Hooper and Musser (1964, p. 28). Both species, they found,

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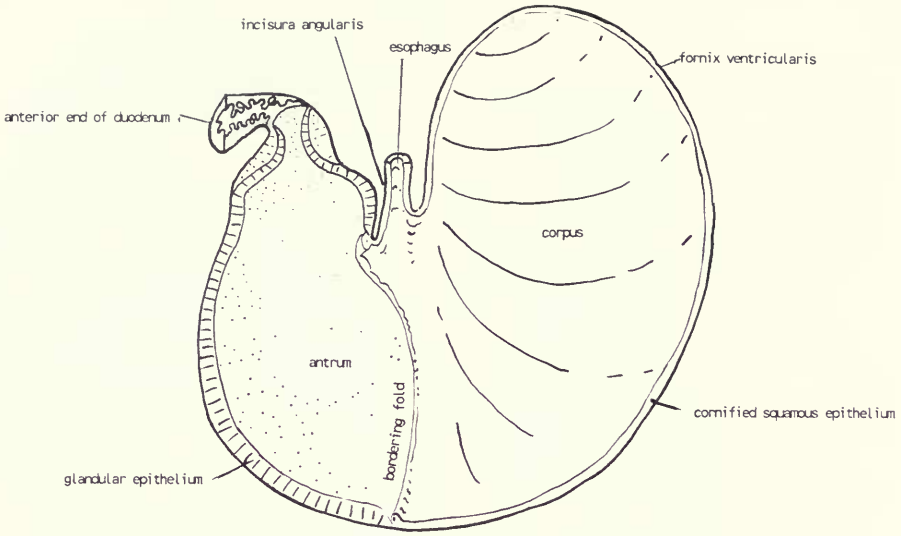
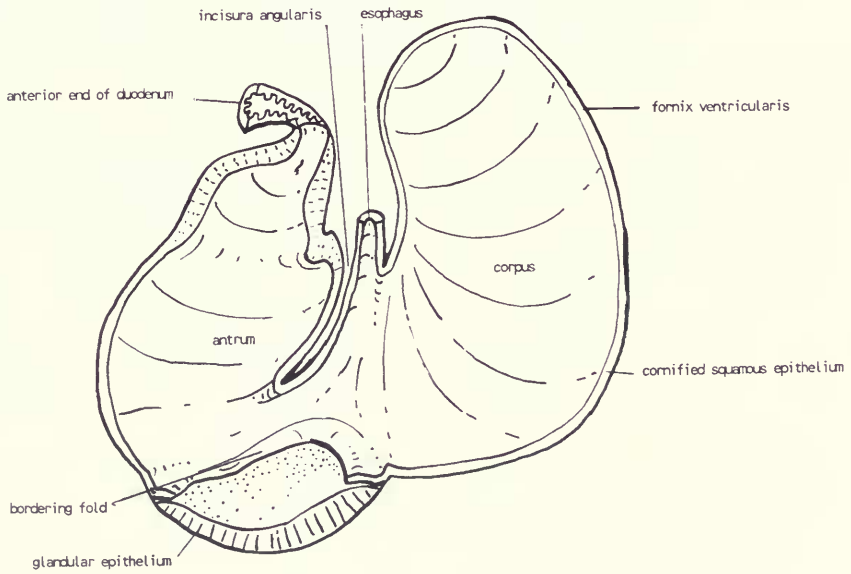
Explanation of symbols, Figure 4. Note: a–h inclusive = procingulid or lophid I; a′, r, r′ = postcingulid or lophid V.

I–V. lophids of pentalophodont molars.
a. anteromedian stylid (may be fused with b, c, or both).
b. anterolabial conulid (may be fused with c).
c. anterolingual conulid (may be fused with b).
d. labiolophulid (may be fused with g).
e. anterior fossette.
f. anterolophulid (may be fused with h, i, or both).
g. prostylid (may be fused with d).
h. anterolophid (may be fused with f, i, s, or combination).
i. anterostylid (may be fused with f, h, s, or combination).
j. protoconulid (may be fused with g).
k. protoconid.
l. paralophulid (may be fused with m, n, or both).
m. ectostylid (may be fused with l, n, o, or combination).
n. ectolophid (may be fused with l, m, o, or combination).
o. hypoconulid (may be fused with m or n).
p. hypoconid.
q. posterolophulid (may be fused with r′).
r′. posterolophid (may be fused with q).
r. posteroconulid (usually not differentiated from posterolophid, r′).
s. mesolophulid (may be fused with h).
t. metaconid.
u. metalophulid (may be fused with v, w, or both).
v. mesolophid (when fused with w = mesolophostylid of pentalophodont molar).
w. mesostylid (when fused with v = mesolophostylid).
x. entolophulid (may be fused with v, w, or both).
y. entoconid.
z. distolophulid (may be fused with a′).
a′. posterostylid.
b′. median fossetid.
c′. posterior fossetid.
d′. protolophulid.
e′. hypolophulid.
f′. murid (zone between lingual and labial lophids and cuspids).
1. preflexid (anterior median fold).
2. anteroflexid (anterior lingual fold; in absence of anterolophid [h] coalesced with 3).
3. metaflexid (first secondary fold).
4. mesoflexid (first primary fold).
5. entoflexid (second secondary fold; in absence of mesolophid [v], coalesced with 4).
6. posteroflexid (second primary fold).
7. supraflexid (anterior labial fold; in absence of labiolophulid [d] coalesced with 8).
8. protoflexid (first minor fold).
9. ectoflexid (major fold).
10. hypoflexid (in absence of ectolophid [n] coalesced with 9).
11. distoflexid (second minor fold).



UNILOCULAR - HEMIGLANDULAR

A



BILOCULAR - DISCOGLANDULAR

B

FIG. 5. Diagrams of two stomach types of New World sigmodontine rodents. **A.** Unilocular–hemiglandular of a South American complex penis type *Oligoryzomys nigripes* (Sigmodontinae). **B.** Bilocular–discoglandular of a North American simple penis type *Neotomodon alstoni* (Peromyscini). Illustrations from Carleton (1973, p. 11, Fig. 1) with labels added.

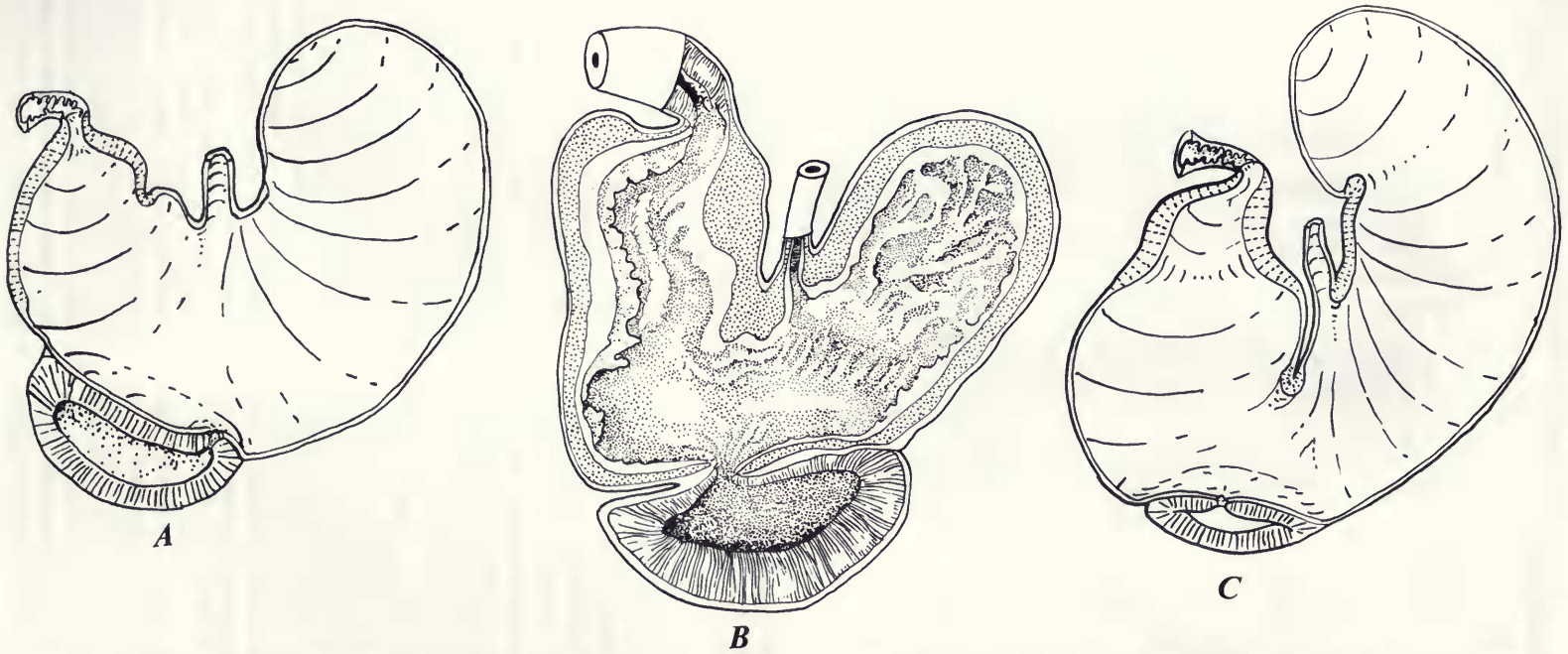


FIG. 6. Pouched stomachs lined with gastric epithelium. **A.** *Oxymycterus misionalis,* Argentina, stomach unilocular–hemiglandular, penis complex, redrawn from Carleton (1973, p. 16, Fig. 5). **B.** *Onychomys leucogaster,* North America, stomach bilocular–discoglandular, penis simple, redrawn from Vorontsov (1962, p. 375, Fig. 12). **C.** *Peromyscus mexicanus,* Mexico, stomach bilocular–discoglandular, penis simple, redrawn from Carleton (1973, p. 21, Fig. 9D).

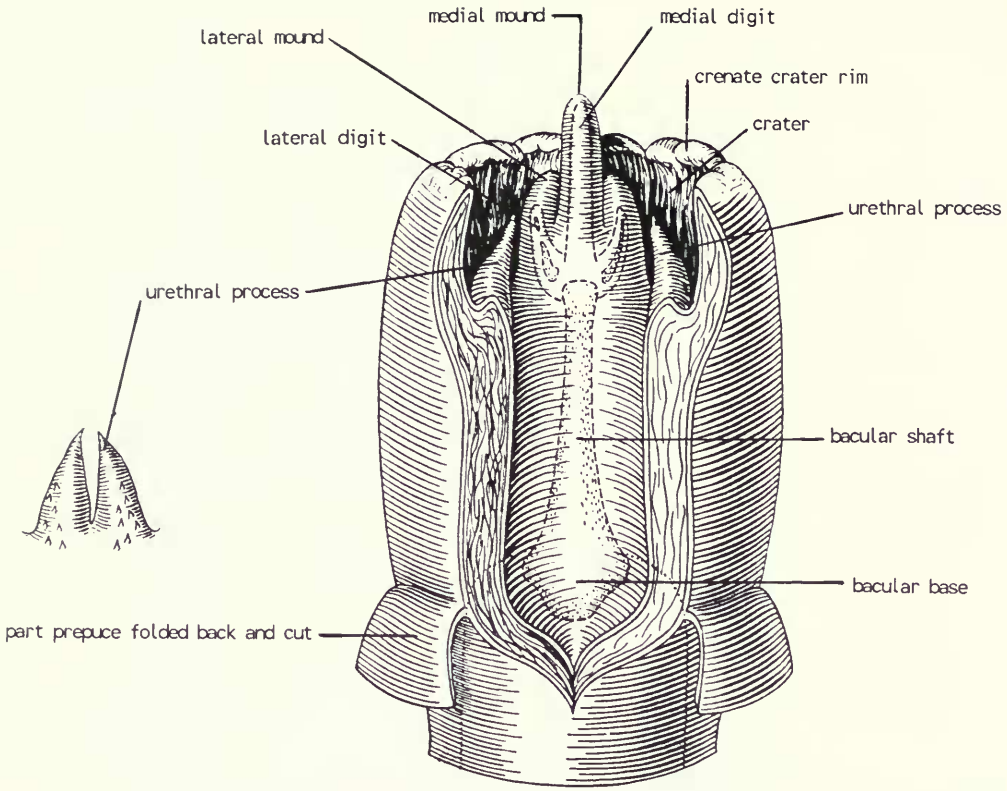


FIG. 7. Glans penis of the paramo hocicudo, *Oxymycterus paramensis* Thomas: Internal anatomy exposed by midventral excision; enlargement of spine-studded urethral process shown in inset; skin of entire glans similarly spiny. Figure copied from Hooper and Musser (1964, Figs. 5d, e) labels added.

were phallically well differentiated from the other 15 genera of Neotropical sigmodontine rodents studied in detail. The *Oxymycterus* they described

> approach species of *Thomasomys* and *Rhipidomys* in some respects (e.g., shape of bone and external appearance), and their relatively small lateral bacular mounds and segments are reminiscent of *Akodon,* but they do not match any of those.
>
> Diagnostic features of the glans include: the crenate crater rim with essentially no bordering band of spineless tissue; dissimilar bacular mounds, the short, erect, peaked, lateral pair contrasting with the laterally compressed medial one; and the robust spinous urethral flap. The distal segments of the baculum are short relative to the bone, the lateral pair particularly slight although slightly osseous. Each erect lateral digit is approximately one-half the length of the bent medial one.
>
> *O. paramensis.*—Gland oblong . . . spinous, and without parotoid lobes but with six slight distal lobes, the pairs of three separated mid-dorsally and mid-ventrally by deep longitudinal troughs; the correspondingly hexalobate crater rim with essentially no ring of nonspinous tissue; bacular mounds dissimilar, the slight, peaked, lateral pair appressed tightly against the longer, deeper-than-wide medial one, its tip bent ventrad; dorsal papilla a low mound with at least two spines, one apically and one subapically; urethral flap robust (length and width about equal) and deeply cleft . . . the two erect attenuate processes spinous apically and ventrally (the spines concentrated in two rows).
>
> Bone of baculum [Fig. 9] slim in ventral view . . . with a narrow proximally projecting base (its ventral face almost flat and its dorsal face narrowly concave between lateral condyles) and a long terminally enlarged shaft; bone in lateral view more robust and gently curved dorsad, its configuration similar to that in *Rhipidomys* and *Thomasomys*; medial digit a slightly deeper-than-wide, slim, cartilaginous rod, its tip inclined ventrad; each lateral digit also rod-like and erect, but smaller in diameter and height and with osseous tissue basally.
>
> *O. rufus.*—The specimens of *rufus* are much like the example of *paramensis* except that they are larger . . . , the lateral mounds appear to be slightly smaller relative to the medial one, the dorsal papilla more spinous (as many as three dorsal spines), the urethral flap also more densely spinous and longer (extending to distal limits of lateral mounds), the proximal face of bone slightly different, and the medial digit flexed more strongly ventrad.

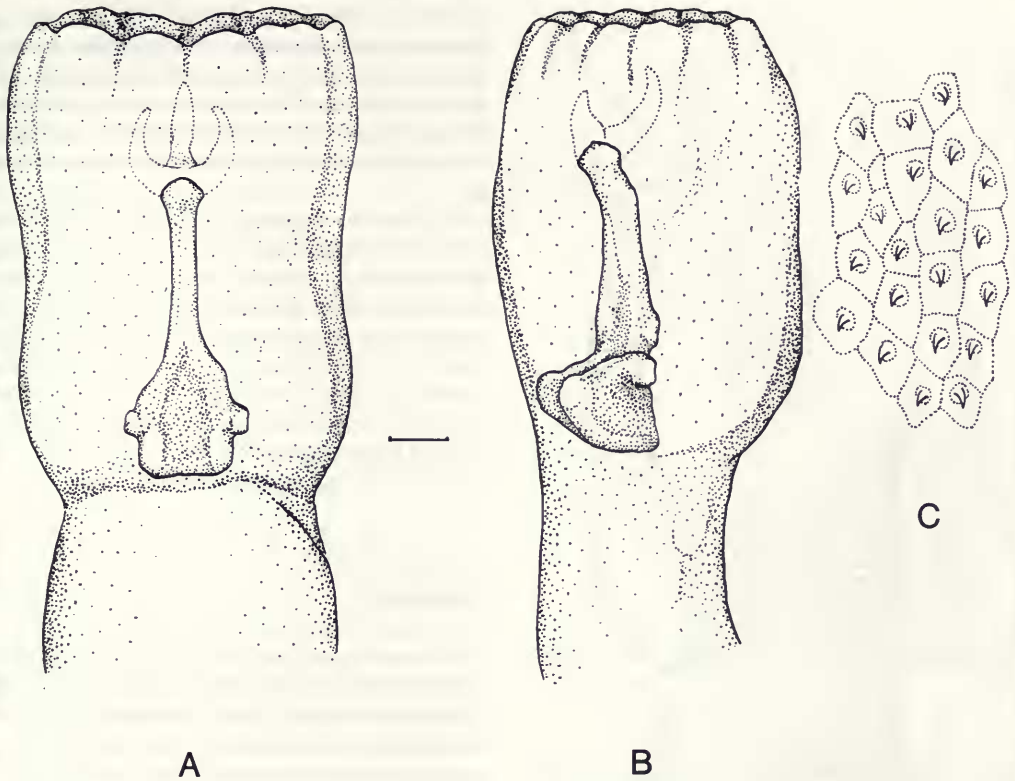


FIG. 8. Glans penis of Robert's hocicudo, *Oxymycterus roberti* Thomas (FMNH 128320). **A,** ventral aspect; **B,** right lateral aspect; **C,** enlargement of spine-studded fragment of glans epidermis.

Accessory Glands (Fig. 10)

The glands of *Oxymycterus delator* (4 specimens) and *O. rutilans* (= *O. rufus,* 6 specimens) have been described by Voss and Linzey (1981, p. 14) as follows:

> Two pairs of preputial glands are present: the large lateral glands extend well beyond the ventral flexure of the penes while the more medial and ventral glands are considerably smaller and do not exceed the prepuce in length; the medial glands are the larger of the two ventral prostatic pairs. Vesiculars [in both species] are lobed medially and along their greater curvatures . . . The subterminal flexures of the vesiculars of *O. delator* are rounded and smooth but they are irregularly lobed in some examples of *O. rutilans* [= *O. rufus*].

Claws (Fig. 11)

Hand and foot claws of *Oxymycterus* range from 2.5 to 8 mm long measured in a straight line. The manual claws may be about 2 mm longer to shorter and usually thinner than the pedal claws.

Because of the long manual claws, hocicudos have been thought to be burrowers. In the original description of *Oxymycterus,* Waterhouse (1837, p. 21) described the claws of *Mus nasutus* as "long but slightly curved and formed for burrowing." The species, however, has never been witnessed burrowing or living in burrows.

The genera of long-clawed truly fossorial sigmodontines are *Geoxus* Thomas, *Chelemys* Thomas, *Notiomys* Thomas, and *Pearsonomys* Patterson. These, all endemic to southern Chile and Argentina, have been described and compared by Patterson (1992b). The eastern Brazilian *Kunsia* Hershkovitz and *Thaptomys* Thomas complete the roster of true burrowing sigmodontines. Their claws are comparable to those of the non-burrowing *Oxymycterus.* Adaptation of certain akodonts to fossorial life as exemplified by *Kunsia* has been described by Hershkovitz (1966, pp. 87–95).

Cytogenetics

The karyotype of *Oxymycterus paramensis, O. rufus, O. platensis* (?= *O. rufus*), *O. nasutus,* and

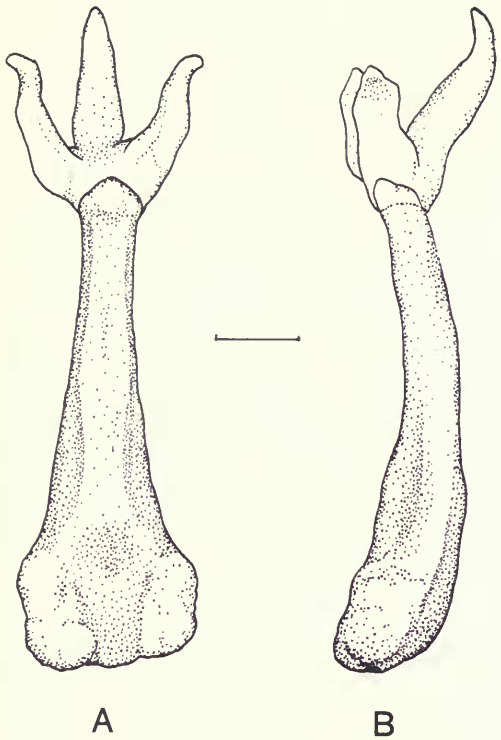


FIG. 9. Baculum (penis bone) of Robert's hocicudo. **A**, ventral aspect; **B**, right lateral aspect.

O. angularis has 54 chromosomes (Vitullo et al., 1986) with no notable differences between each, the C- and G-banding patterns identical, according to Vitullo.

The karyotype of *Oxymycterus akodontius,* examined by Kajon et al. (1984), has the same karyotype, its fundamental number 64. The autosomes include 2 large subtelocentric pairs, 44 acrocentrics of decreasing size, and 3 metacentric pairs. Examination of additional complements including that of *O. rufus* from Entre Rios, Argentina, and others believed to represent *O. hispidus,* all with identical karyotypes, adds to an impression that *Oxymycterus* may be cytogenetically monomorphic.

Coloration and Habitat

The species vary from dominantly dark brown or blackish agouti to reddish or orange agouti on dorsal surface and sides. The molt is from blackish to reddish, often mottled. Species have been described on the basis of either the eumelanic or phaeomelanic dominance of a single specimen, although both colorations may be present in the same population. Underparts may be dominantly grayish (eumelanic) or dominantly orange (phaeomelanic), with the latter usually overlying the other.

Correlation between coloration of these mice and their habitat is not evident in present material. Activity of any species may be mostly nocturnal, diurnal, or both, midday excluded. Concealment, however, depends on the regular availability of suitable cover day or night, whether in *caatinga, cerrado,* or rain forest. Color differences between sympatric species reveal no pattern that to our limited knowledge can be correlated in either sympatriot with habitat or behavior.

Enemies

Hocicudos, no less than others of their nature, are fair game for any predator of small mammals. Included among the most predaceous are the four-eyed opossums, *Philander* and *Metachirus.* Hocicudos themselves are also predaceous and cannibalistic.

Relationships

An oxymycterine generic group, presumed monophyletic, constructed by Hershkovitz (1966, p. 86), consisted of *Oxymycterus, Podoxomys, Lenoxus, Microxus,* and *Abrothrix.* Natural coherence of the group has since been questioned. Reig (1987, p. 361) admitted the genus *Lenoxus* but only as "an exaggerated *Oxymycterus* in size and skull morphology." The short-clawed *Abrothrix,* he believed, belonged with *Akodon. Podoxomys* and *Microxus* also appeared to be out of line, despite the opinion of Ellerman (1941). Hinojosa et al. (1987) also questioned the soundness of the generic assemblage as a tribe. The authors definitely excluded *Microxus* but would add *Blarinomys* and *Geoxus.* Neither of the last two is, in my opinion, related to *Oxymycterus* or to each other. Pérez-Zapata et al. (1992, p. 220) pointed to the closer relationship between *Microxus* and *Podoxomys* than between either and *Oxymycterus.* Geographic isolation of *Oxymycterus* south of the Amazonian boundary also weighed against assumption of a close relationship to *Podoxomys.*

Accumulated knowledge of *Oxymycterus* indicates that what may have appeared to be the cohesive features of a natural group were, for the most part, convergent characters among unrelated akodontines. Only *Lenoxus* has the semblance of a sister genus but is manually short-clawed.

Claws figured by Hinojosa et al. (1987, p. 12) reveal the long claws of *Oxymycterus inca* contrasted with short claws in non-oxymycterine *Podoxomys, Microxus,* and *Lenoxus.* Correlated with the short claws are the rounded or pointed nasal tips (*op cit.,* p. 13) compared with the squared nasal tips of *Oxymycterus inca.*

Origin and Dispersal (Fig. 1)

Oxymycterus has no known near living or extinct relative north of the Rio Amazonas–Solimões-Marañón boundary. The geographic division indicates a far southern latitudinal origin with dispersal northward ultimately halted by the Amazonian boundary and the upper Andean tree line. The dispersal must have been from a southern core with an eastern branch on the Atlantic coastal plains and highlands and a western branch along the rising Andes with limited infiltration of marshes between the divergent highland branches. Extensive floodlands are barriers to the nonaquatic *Oxymycterus.*

Removal of the manually short-clawed *Microxus* and *Podoxomys* from the illusory oxymycterine generic group eliminates all signs of an oxymycterine presence north of the grand river. No later than the Pleistocene, the Amazonian basin was a mediterranean sea separating the Guianan and Brazilian shields. Also known as Lake Amazonas, the basin was described by Campbell (1990, p. 34) as "the largest freshwater lake the earth has ever known covering all the Amazonian Basin and contiguous areas to an elevation of approximately 300 m."

The Species

A total of 23 forms of long-nose mice have been named, 13 of them by Oldfield Thomas of the British Museum (Natural History). The first to be described was Azara's *Rat cinquieme* or *rat roux,* in 1801. It received the binomial *Mus rufus* by Fischer in 1814, and *Mus rutilans,* an objective

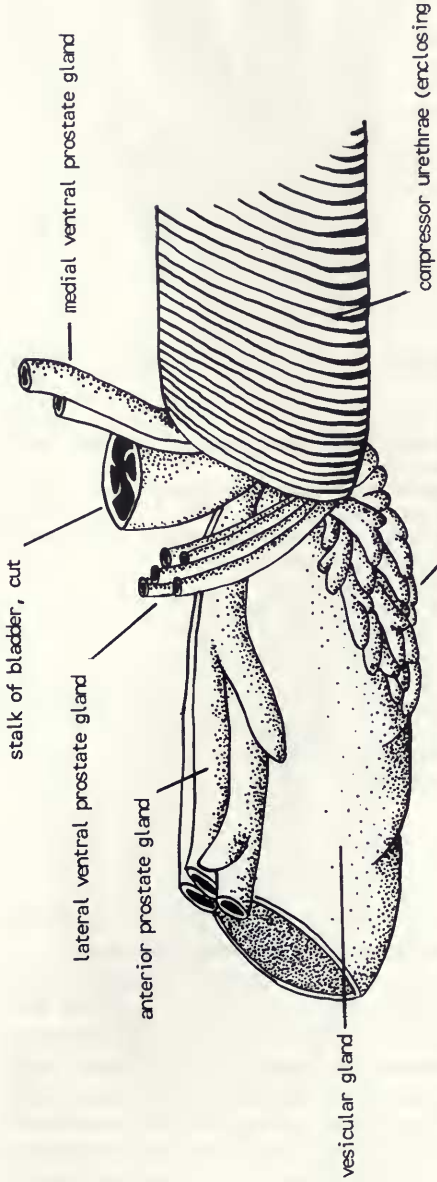


FIG. 10. Portion of male sigmodontine reproductive tract showing prostatic ducts (deferent ducts and ampullary glands omitted). Accessory glands reproduced from Voss and Linzy (1981, Fig. 2), the labels added.

TABLE 1. *Oxymycterus* species: Arranged in size classes of Atlantic and Andean divisions; measurements are of holotypes, others shown in brackets [ ]. CB = condylobasal length; HF = hind foot with claw; ML = length of upper molar row.

Atlantic Division sizes (mm)				Andean Division sizes (mm)			
	CB	HF	ML		CB	HF	ML
Large				Large			
angularis	—	30+	5.6	*doris*	32.5	31+	5.5
hispidus	36.9[1]	34[1]	6.9[1]	*inca*	[32.3][8]	33	5.7
judex	39[2]	34.5	5.8	*iris*	37[9]	33	5.7
misionalis	38.5	36	5.7	*juliacae*	36.4[10]	32	8[11]
platensis	33.2	33[2]	5.4				
quaestor	—	34	5.8				
rostellatus[3]	—	—	—				
rufus	—	36	—				
dasytrichus[4]	—	—	—				
Medium				Medium			
roberti	[31.7][5]	33 [29][5]	[4.9][5]	*paramensis*	[32.5][12]	27.5	4.9
				nigrifrons	[28.0][13]	30	5
				jacentior	32.6[14]	28	5
				akodontius[15]	27	26+	5.2
Small				Small			
amazonicus[6]	[29.6]	[28.0]	[5.0]	*hiska*	25.1	25	5.01
delator	—	28.5	5.0	*hucucha*	24.1	21	4.1
nasutus[7]	[27.6]	[29.2]	[4.8]				

[1] Measured from original figures of holotype, which may be larger than in life.
[2] Estimated.
[3] Corpus 6″ 3‴ (= 163 mm), cauda 3″ 10‴ (= 80 mm).
[4] Head and body 1″ 10 1/3‴ = 474 mm; only measurement.
[5] Mean of 11, 18, and 17 individuals in same order.
[6] Mean of 12 paratypes, HF dry.
[7] Mean of five topotypes.
[8] Mean of five from SE Peru.
[9] Greatest skull length of holotype.
[10] Greatest skull length of holotype.
[11] Measurement out of line.
[12] Greatest skull length; mean of nine from Cochabamba.
[13] Mean of 13 paratopotypes.
[14] Dimension out of line; see p. 32.
[15] Juvenal.

synonym, by Olfers, in 1818. The last species, *Oxymycterus amazonicus,* is described below.

Until the present, the numerous described forms of *Oxymycterus* had never been organized, their interrelationships never defined, their geographic distribution never mapped. Gyldenstolpe's (1932) arrangement of the species is haphazard, his diagnoses and information borrowed uncritically from the original literature, his own contributions meager. Notwithstanding, his was the primary source of compiled information and remains useful for its morphometrics and illustrations of type skulls and teeth. Cabrera's (1961) catalog of South American mammals lists all species alphabetically, the higher categories in phylogenetic order. Cabrera reduced the number of species by casting many as subspecies, his action based on original descriptions and reliance on his unequaled taxonomic acumen. The geographic distribution attributed to each taxon is, in most cases, an educated guess. Musser and Carleton (1993) adopted Cabrera's systematic arrangement but recognized only species, the erstwhile subspecies reduced to synonyms of their presumed nominal senior relatives. The action may well have been dictated by editorial policy.

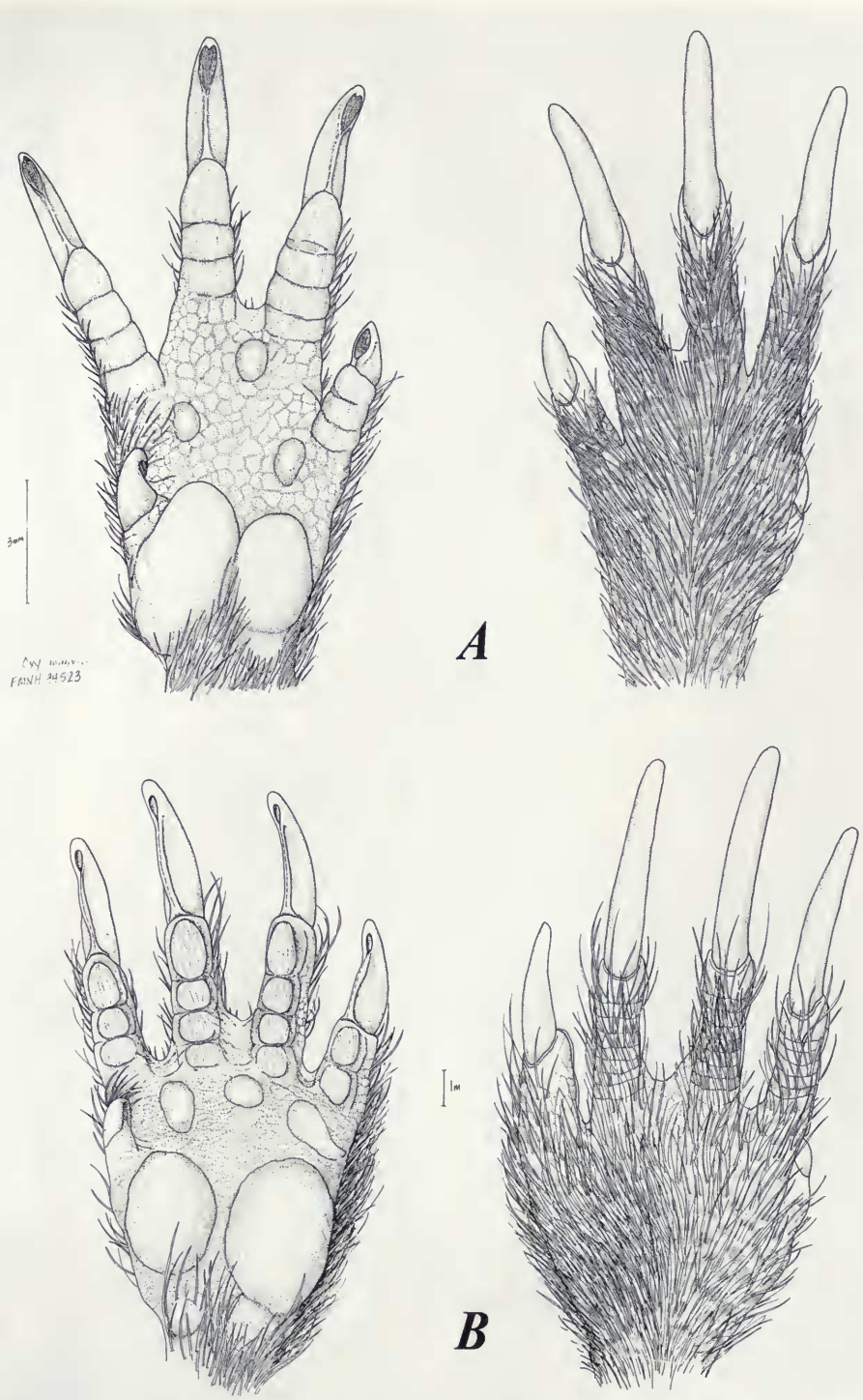


FIG. 11. Right hands of two long-clawed sigmodontine mice. **A.** Non-burrowing Amazonian hocicudo, *Oxymycterus amazonicus* Hershkovitz (Brazil). **B.** Burrowing raton topo, *Chelemys megalonyx* Thomas (Chile). Left, palmar surface; right, dorsal surface.

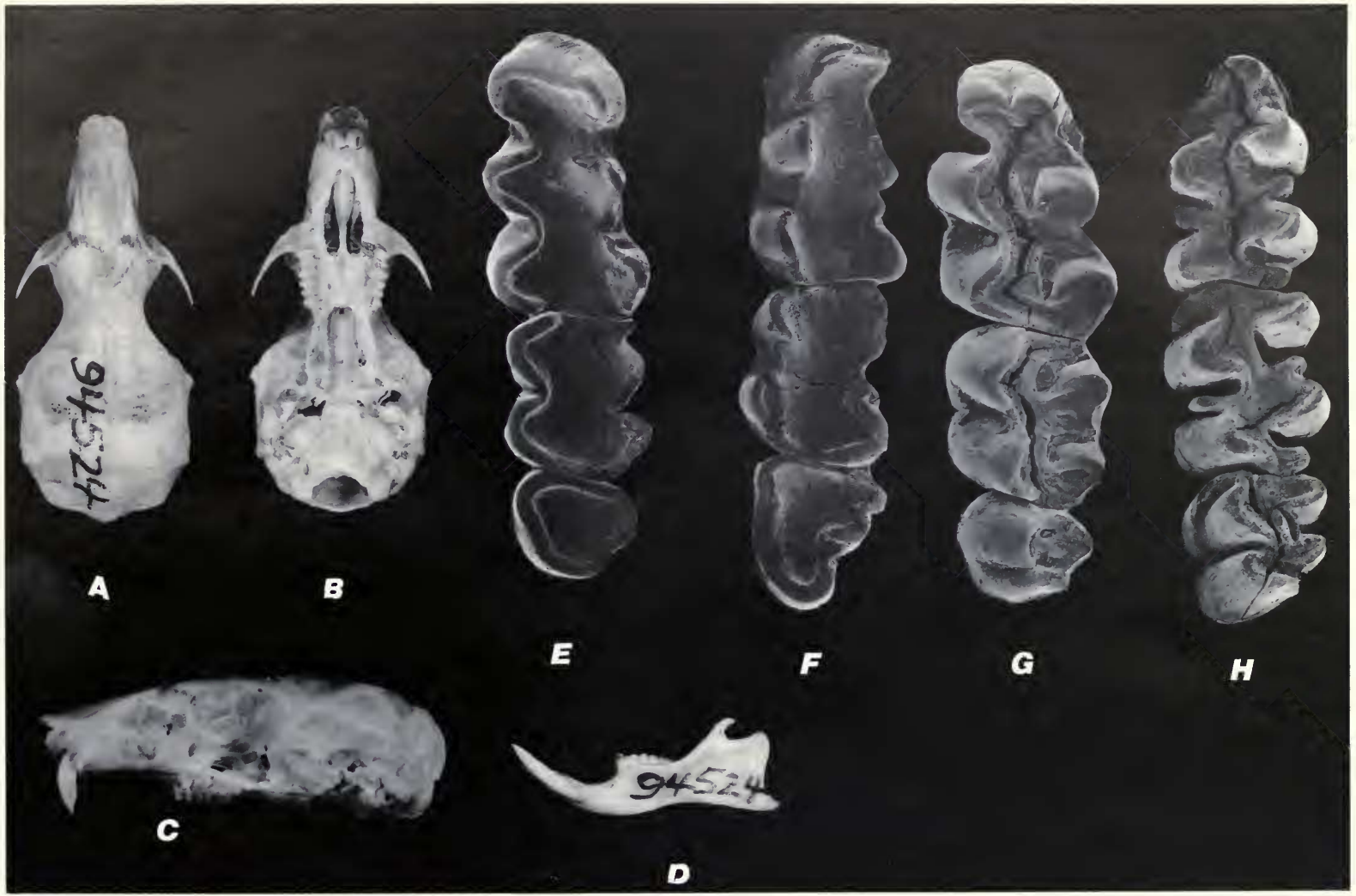


FIG. 12. *Oxymycterus amazonicus*. Skull (**A, B, C, D**); molars, **E**, upper; **F**, lower, of holotype (FMNH 94524♂), Fordlândia, Rio Tapajóz; **G**, upper molars; **H**, lower molars of paratype (MPEG 9000♂), Altamira, Rio Xingú. For cranial and dental measurements, see Table 2.

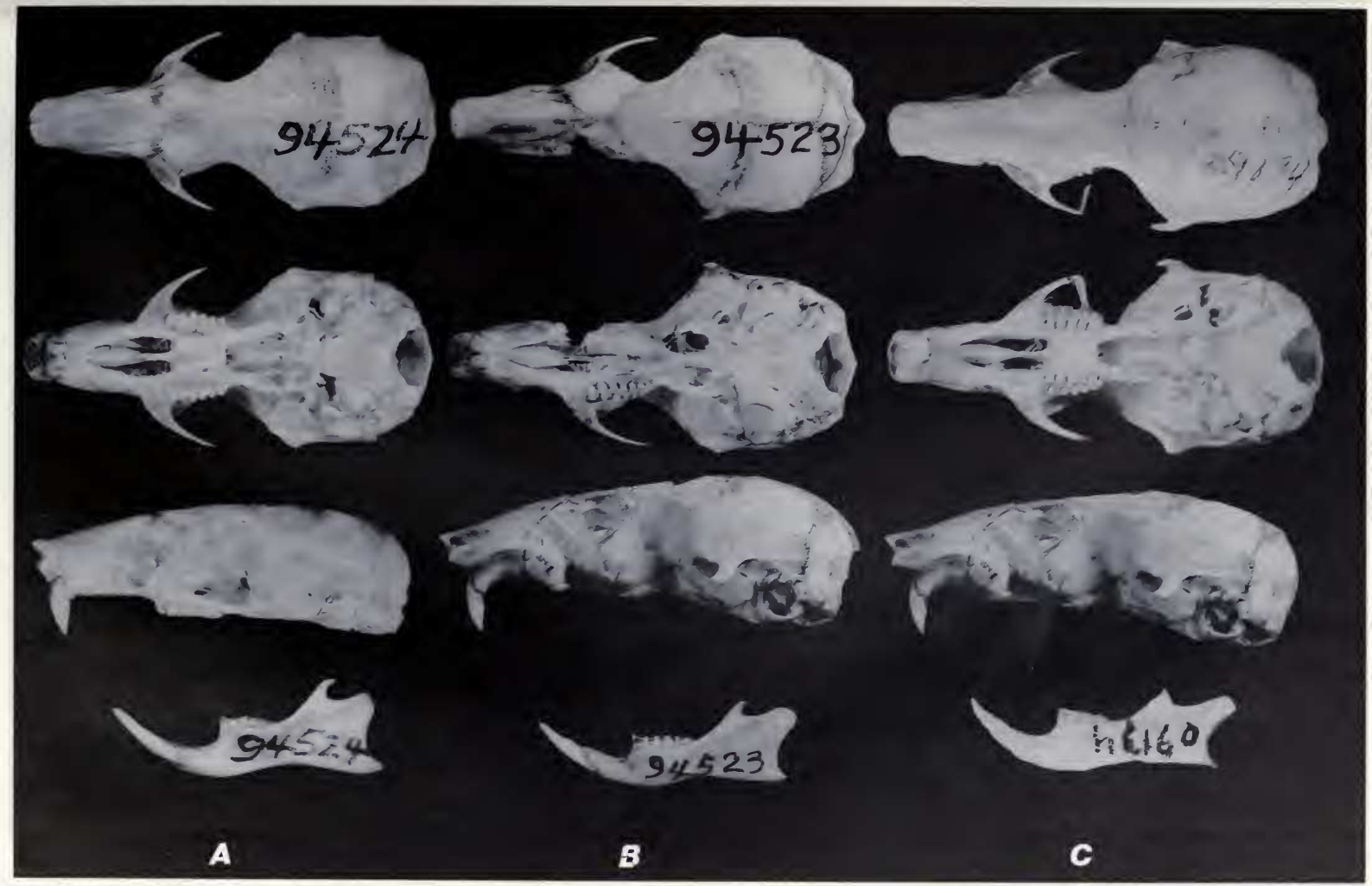


FIG. 13. *Oxymycterus amazonicus*. Skulls compared: **A**, holotype (FMNH 94524); **B**, paratype (FMNH 94523) Fordlândia; **C**, paratype (MPEG 9134♂), Itupiranga, Rio Tocantins. For measurements, see Table 2.


A
B

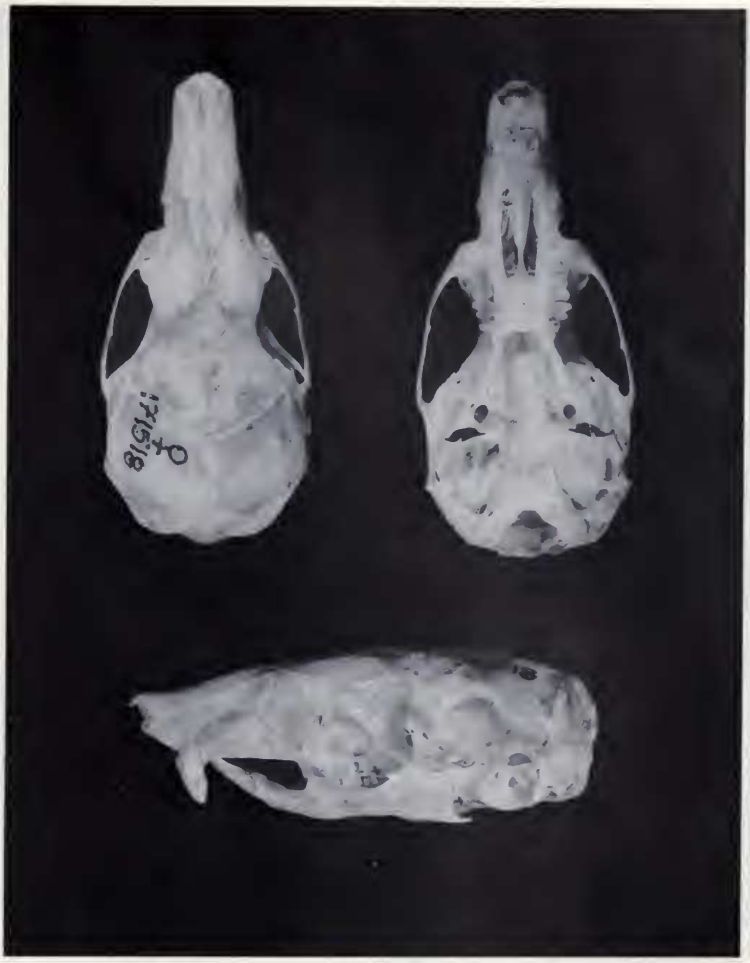


FIG. 15. *Oxymycterus hiska.* Skull: dorsal, ventral, and lateral views with mandible attached, of paratype (MVZ 171518♂); GSL = 30.6 mm; upper molar row, 4.8. Yanahuaya, Puno, Peru. Photographs courtesy of Hinojosa, Anderson, and Patton.

Size Classes (Table 1)

Geographic distribution of the species of *Oxymycterus* may be either Andean or Atlantic coastal and highland. Amazonian hocicudos are extensions of one or the other group. Bodily dimensions of adults of each geographic division sort into large, medium, or small.

The criteria for estimates of size classes are condylobasal length of skull (CB), hind foot length with claw (HF), and upper molar row (ML). Each or any combination of measurements may be decisive. The dimensions given in Table 1 are those of the holotypes as originally published. Where lacking, the mean [in brackets] of topotypes or other representative adults is given. The data are incomplete but deemed adequate for rough estimates or perceptions of the values of each size class. All nominate forms are represented in the table. There appears to be little or no overlap in the measurements between each size class of each division. In effect, each size class of each geographic division is the equivalent of a species group, in

←

FIG. 14. *Oxymycterus angularis.* Molars: upper and lower little worn **A** (FMNH 2302♂) and little worn **B** (FMNH 2198♂); most to all lophs and lophules disappear or become indistinct after moderate wear; measurements of B, 5.4 mm (GSL = 36.8).

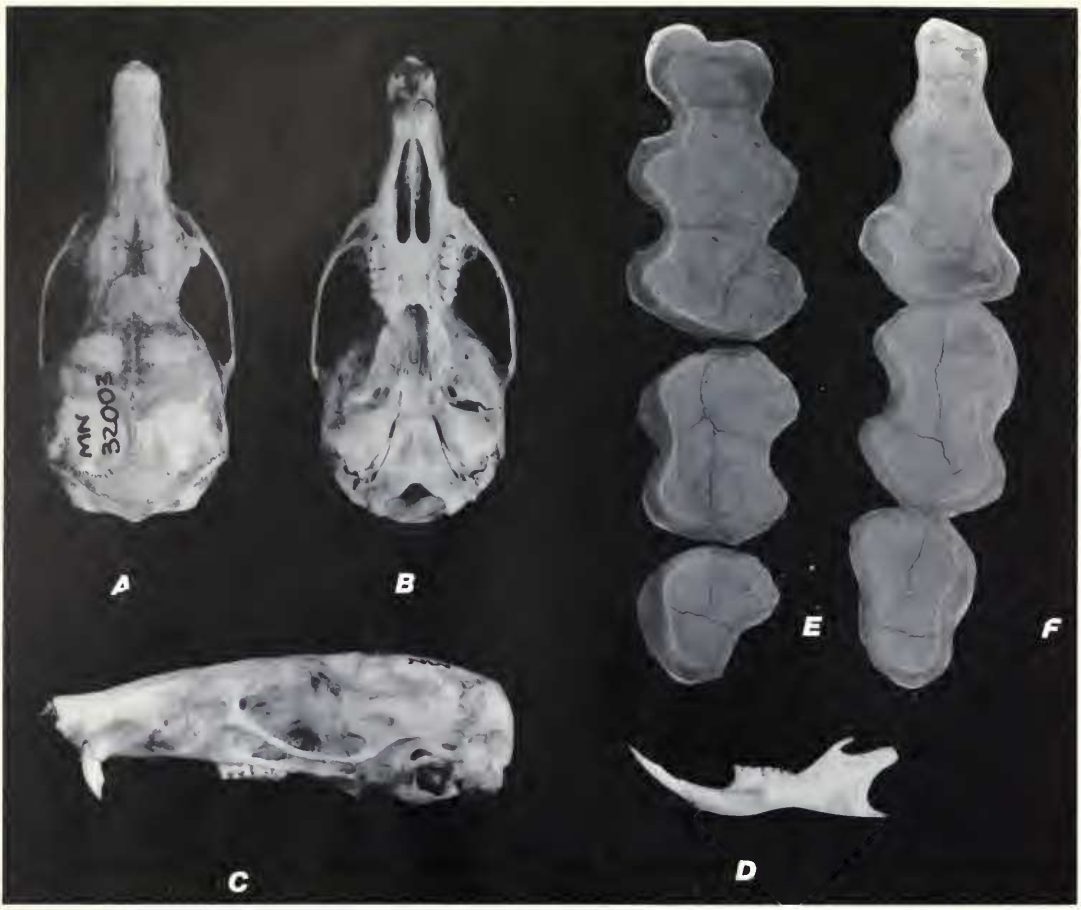


FIG. 16. *Oxymycterus hispidus.* Skull (**A, B, C, D**); molars, **E,** upper; **F,** lower (MNR 32003♂); GSL = 38.8 mm; molars, 5.6. Caparaó National Park, Minas Gerais, Brazil.

most cases the species itself. In any case, phylogenetic relationships between size classes are not implied. The hocicudos of both divisions might have diverged from a common ancestor, one following the Atlantic dispersal route, the other the Andean, with the species of each division evolving independently. This, however, is speculative. Compared for size, class for class, those of the Atlantic Division are the larger and more diversified.

Sympatry

Sympatry, or the crossing of paths by congeneric species at any time within the life span of the taxa, has not been fully documented for *Oxymycterus.* There is evidence, nevertheless, that sympatry between two or more congeneric species does occur throughout most of the geographic range of the genus. The larger species, generally identified as *Oxymycterus rufus* or *O. hispidus,* may coexist with medium-size *roberti* or small-size *O. nasutus.* Likewise, medium-size *O. paramensis* may cross trails with large *O. inca,* and small *O. hiska* or *O. hucucha.* Thomas (1896, p. 309) reported *O. iheringi* and *O. nasutus* from Taquara, Rio Grande do Sul, but the current generic status of *O. iheringi* is under revision and not included in Table 1.

Annotated Catalog of Described Forms of *Oxymycterus*

All named forms are listed alphabetically except the first described as new. Each listing includes available type data and comments by this and other reviewers.

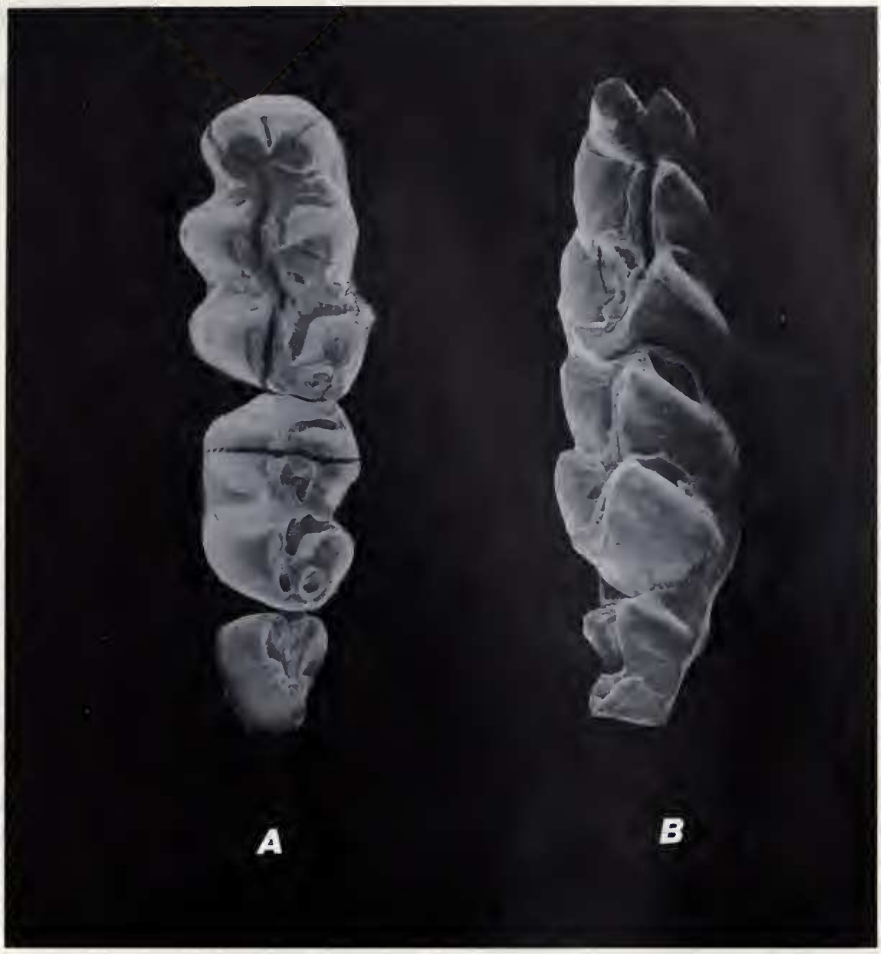


FIG. 17. *Oxymycterus hispidus.* Molars, **A,** unworn upper; **B,** unworn lower (FMNH 94543♂). Primeiro Morro, São Paulo, Brazil.

Oxymycterus amazonicus, new species (Figs. 12, 13)

Oxymycterus sp. nov. A, Patterson, 1992a:27—BRAZIL: *Pará;* Marai, Rio Tapajóz.

Oxymycterus inca, Emmons and Feer (part, not Thomas) 1990:191—BRAZIL: *Pará* (south of the Rio Amazonas).

HOLOTYPE—Adult male, skin and skull, Field Museum of Natural History no. 94524, collected 27 January 1961, by A. M. Olalla, original number 1066.

TYPE LOCALITY (Fig. 2)—Fordlândia, right bank, lower Rio Tapajóz, Pará, Brazil, 3°40′S, 55°30′W.

DISTRIBUTION (Fig. 1)—Known from the south bank of the lower Rio Amazonas and lower parts of tributaries Tocantins, Xingú, Tapajóz, and middle Rio Madeira. The range may extend eastward along the Atlantic coast to the Brazilian bulge, where *Oxymycterus angularis* is represented in the State of Ceará. In all cases, *Oxymycterus* seeks the higher ground or levees.

Oxymycterus amazonicus is the only species of the genus known to occur in the lower Rio Amazonas basin. It may represent a relict population that once ranged from near sea level to the headwaters of the lower Amazonian tributaries, or it may have spread from the headwaters to the lower half of the Amazonian basin. More likely it has newly infiltrated from the east.

DIAGNOSIS—A chocolate-colored mouse with sharply defined orange to reddish orange underparts; size small among Atlantic Division hocicudos species (Table 1); skull with rostrum comparatively short, robust, nasals with little taper or

TABLE 2. Measurements (in mm) of type series of *Oxymycterus amazonicus*. Means, extremes, and number of samples are included at bottom.

Museum	Catalog number	Date	Sex	Total length	Head and body	Tail	Hind foot	Ear	Greatest skull length
Rio Tocantins, near Itupiranga, 26 km N, 30 km W Marabá, 05°09′S, 42°20′W									
MPEG	9134	11/6/76	♂	217	121	96	27	13	34.2
Rio Xingú, 54 km S, 150 km W Altamira, Pará, 03°12′S, 52°12′W									
MPEG	8992	17/8/75	♂	211	131	80	27	15	—
MPEG	9000	1/7/75	♂	208	114	94	29	14	32.9
MPEG	9008	27/7/75	♂	208	115	93	26	13	33.6
MPEG	9018	27/8/75	♂	230	130	100	28	15	34.7
MPEG	9025	24/9/75	♂	170	120	50 (bob)	28	14	32.3
MPEG	9029	19/11/75	♂	220	125	95	29	12	31.2
MPEG	9050	27/7/75	♂	198	119	79	30	11	—
MPEG	8999	25/6/75	♀	213	132	81	27	13	31.9
MPEG	9002	2/7/75	♀	200	120	80	26	14	31.7
MPEG	9031	28/11/75	♀	219	131	88	27	13	32.8
Rio Tapajóz, Fordlândia, Pará, 03°40′S, 55°30′W									
FMNH	94523	27/1/61	♂	215	130	85	28	—	32.1
	Paratype			210	125	87	28	13	32.7
				(140–230)	(114–132)	(75–96)	(26–30)	(11–15)	(31.2–34.7)
FMNH	94524	27/1/61	♂	221	136	75	27	—	32.0
	Holotype			13	13	12	13	11	11

expansion to trumpet shape; tips nearly square and little produced beyond perpendicular plane of outer incisive border; vestige of mesoloph (id) present, of upper usually fused with one or another lophule or adjacent cusp.

EXTERNAL—(All dry skins, except of holotype and paratype, were prepared from liquid-preserved specimens.) Pelage fairly dense, of dorsum about 1 cm long; upper parts of body dominantly brownish, sides more reddish, the subterminal pheomelanin bands wider; underparts orange but with slaty basal portion of hairs showing through on chest, belly, and limbs, ventral midline more reddish; crown and upper surface of muzzle reddish brown like back; tip of nose with blackish patch or stripe; ears brown; hands (Fig. 11), feet, and tail blackish; frontal hairs tufted but condition may be an artifact of preparation; vibrissae thin, inconspicuous, manual digital vibrissae hardly extending beyond distal phalanges, pedal digital vibrissae extending halfway to claw tips; mystacial vibrissae barely extending to base of ears; skin between pedal digits palmate, outer pedal digit with claw extending to base of fourth digit, inner digit extending to base of second phalange of digit II, digit III longest, IV slightly shorter; length of each middle digit claw little more than half digital length; manual digits with claws slightly shorter or longer and weaker than pedal, the inner vestigial, the outer reduced; tail little more than half combined head and body length, hairs short, stiff, about 2–3 scales long, the slightly imbricated rhomboidal scales showing through, their arrangement annular with 3 hairs per scale.

Nipples—2 pair pectoral, 1 pair inguinal, total 6.

CRANIAL—All skulls except those of holotype and paratopotype more or less damaged from overboiling and careless cleaning; type skulls damaged by trap; rostrum thick, nasals broad, square at tip, obtusely pointed behind, narial aperture subtriangular, anterior border projected little beyond perpendicular plane of anterior surface of incisors in types, more or less the same in type series; width of subovate incisive foramina 3 mm, posteriorly extending to second reentry fold of M^1; temporal ridges poorly defined in types, more or less in others; interparietal bone 2.2 × 7.1 in holotype, 3.3 × 9.4 in paratype; zygomatic arches slender, zygomatic plate moderately expanded, width about equal to length of m^1, visible when viewed from above; width of mesopterygoid fossa 2.3 mm; additional measurements in Table 2.

DENTAL—Molars of all specimens examined except types are cracked or broken from overboiling of skulls in cleaning process, inner or dentine surface of incisors stained brown except in types; upper incisors short, comparatively stout, cutting edge plane, outer surface naturally pigmented orange;

TABLE 2. Extended.

Condylo-basal length	Zygomatic breadth	Inter-orbital width	Braincase width	Nasal length	Incisive foramina	Palatal length	Zygomatic Diastema	Zygomatic plate	Molar row
31.4	—	5.7	13.4	12.3	7.3	3.5	8.4	2.6	5.2
—	—	—	—	—	—	—	—	—	—
29.5	14.3	6.1	13.3	12.1	7.0	3.8	7.4	3.1	5.3
30.6	15.6	6.0	13.6	13.3	6.6	4.5	8.1	1.1	4.9
32.0	15.7	6.6	14.2	13.7	—	—	8.6	2.9	5.2
28.6	14.4	—	13.6	11.7	6.6	3.8	7.1	2.8	4.8
29.2	14.0	6.2	13.4	—	7.0	3.9	7.6	2.7	5.1
28.0	14.2	5.8	13.3	—	—	—	7.7	0.7	5.0
28.9	14.6	6.4	13.5	11.6	7.0	4.2	7.9	2.6	4.9
28.8	15.1	6.3	13.7	12.0	7.0	—	7.4	2.8	4.5
29.8	15.1	6.3	13.8	11.7	6.7	4.5	7.9	2.8	5.3
28.8	—	6.1	13.5	11.5	—	—	7.5	2.6	4.8
29.6	14.8	6.2	13.6	12.1	6.9	4.0	7.8	2.4	5.0
(28.0–31.4)	(14.0–15.7)	(5.7–6.6)	(13.3–14.2)	(11.4–13.7)	(6.6–7.3)	(3.5–4.5)	(7.1–8.4)	(0.7–2.9)	(4.8–5.3)
29.4	—	6.4	13.5	11.4	6.8	3.9	7.8	2.4	5.0
12	9	11	12	10	9	8	12	12	12

molars hypsodont, 3-rooted, tetralophodont, crowns terraced, valleys deep, anterior median fold well defined, anterolophule, labiolophulid, ectolophid present, mesoloph (id) vestigial, absent or fused with 1 or 2 accessory lophs such as paralophule, metalophule (id) entolophulid, or an adjacent cusp (cf. Hershkovitz, 1993, Fig. 7).

Holotype with occlusal surface of molars eroded to deeply dished 8-shaped configuration; procingulum of first molars with anterior median fold almost completely obliterated by wear; moderately worn molars of paratopotype (FMNH 94523) terraced, the outer cusps sharply defined, anterolophule present; paracone of first and second molars with prominent paralophule, of another specimen (MPEG 0900) with 2 paralophules, the inner fused with stub-like mesoloph; mandibular teeth of holotype excessively worn, of paratopotype with anterior median fold of m_1 sharply defined, labiolophulid and ectolophulid of $m_{1,2}$ well developed, anterior labial fold well defined in all molars; mesolophid vestigial in all lower molars.

VARIATION—Of the 14 prepared specimens, all but the holotype and paratotype were skinned out of formalin. They agree well with the type description except pelage is in better condition despite effects of liquid preservative; pelage of underside of limbs shows more gray at base; cheeks grade from dominantly brown to entirely orange like neck; basicranium, interorbital region, and turbinates considerably damaged or destroyed by the cleaning method; temporal ridges of skull more marked than in holotype; palate extends to or slightly beyond line drawn across posterior border of last molars. Exposed dentine of upper and lower incisors with a purplish stain presumably acquired during immersion in formalin.

COMPARISONS—The small size of *Oxymycterus amazonicus* obviates the need for comparisons with species of the large- and medium-size classes of the Atlantic Division (Table 1). Of the two other small-size-class species of the Atlantic Division, the Uruguayan *Oxymycterus nasutus* is readily distinguished from the dark brown, nearly blackish *O. amazonicus* by its bright ochraceous coloration throughout, softer pelage, pale hands and feet, bicolor tail, narrower, more tapered nasals, smooth braincase, slender mandible, and longer, finer lower incisors.

Specimens of *O. delator* with some small-size-class measurements were not available for comparisons. The original description is of a dark-colored animal with undersurface notably paler than that of *O. amazonicus,* head with a light patch behind and above each eye absent in *amazonicus* and all other hocicudos known to me, and tail thickly and uniformly haired as contrasted with the virtually bare tail of other hocicudos. Description of the nasals suggests the narrower characters of *O. nasutus.* Outstanding in Thomas's original

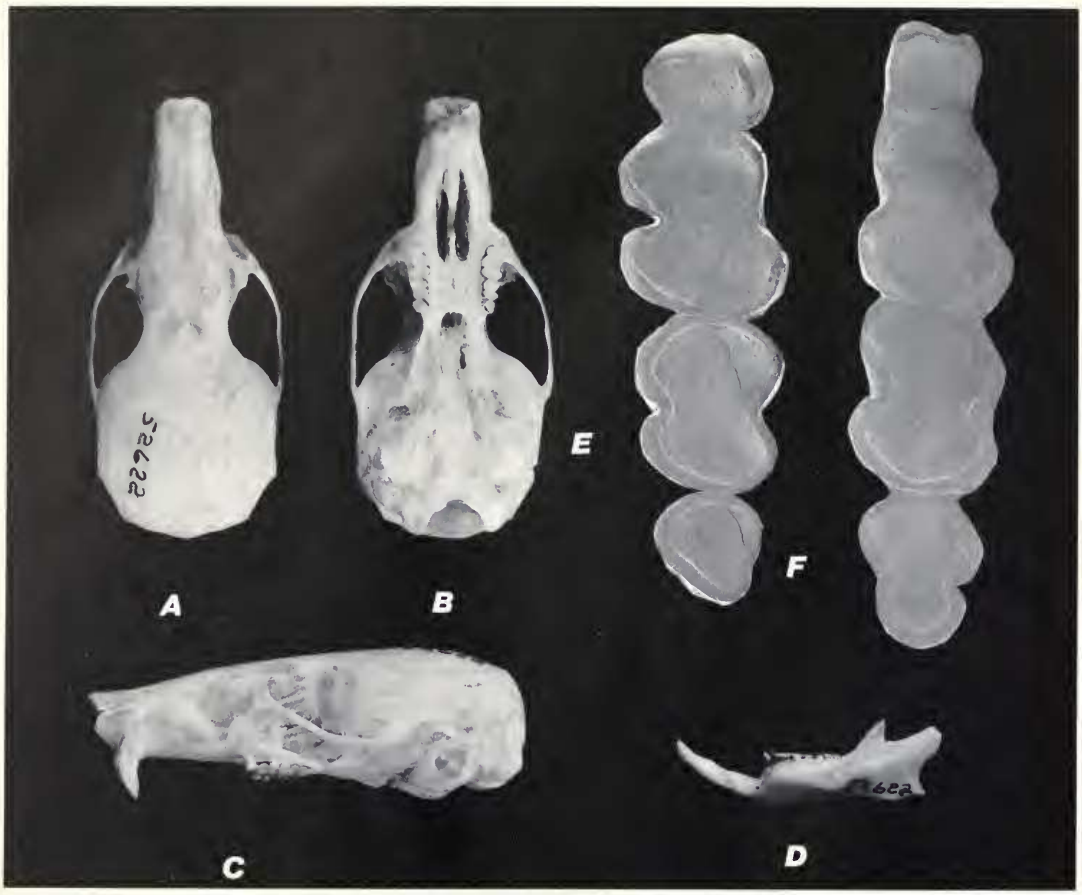


FIG. 18. *Oxymycterus juliacae.* Skull (**A, B, C, D**); molars, **E,** upper; **F,** lower (FMNH 52622); GSL = 34.9 mm; molars, 5.3. Segrario, Puno, Peru.

description are a combined head and body length of 155 mm coupled with a tail length of 106 mm. Both measurements belong with such large-size hocicudos as the Paraguayan *O. rufus* or *O. misionalis.* Cranial and hindfoot measurements, however, are those of small hocicudos (Table 1).

Oxymycterus hiska and *hucucha* of the Andean Division are extremely small and need no comparison with *O. amazonicus* (Table 1). *O. akodontius,* assigned to the medium-size class (Table 1) is a juvenal. Had it been given a chance, it would have grown into its proper medium-size class, or perhaps the larger class.

REMARKS—The series of *Oxymycterus amazonicus* was loaned by the Museu Paraense Emilio Goeldi for identification and possible description. Field Museum Curator of Mammals Bruce Patterson, who was at the time studying some Amazonian material received from the Royal Natural History Museum, Stockholm, for identification, recognized a specimen of the new species among the rodents. He generously added it to those being described in this paper.

Other specimens of the then undescribed *O. amazonicus* were recorded by Emmons and Feer (1990, p. 191) under the name of the very similar appearing but larger Andean *Oxymycterus inca.*

SPECIMENS EXAMINED—Total 15. BRAZIL: *Pará* (Rio Tapajóz, Fordlândia [0340/5530], holotype and paratopotype, FMNH; Marai = Mararú, Rio Tapajóz [0226/5442], 1 [RNHMS]; Marabá [0521/4900], Rio Tocantins, 2 [MPEG]; Altamira [0312/5212], Rio Xingú, 9 [MPEG]; Mato Grosso (Rio Aripuanã, Humboldt, 1 [USNM]).

Oxymycterus akodontius Thomas

Oxymycterus akodontius Thomas, 1921:615. Cabrera, 1961:466—distribution; "possibly only a color

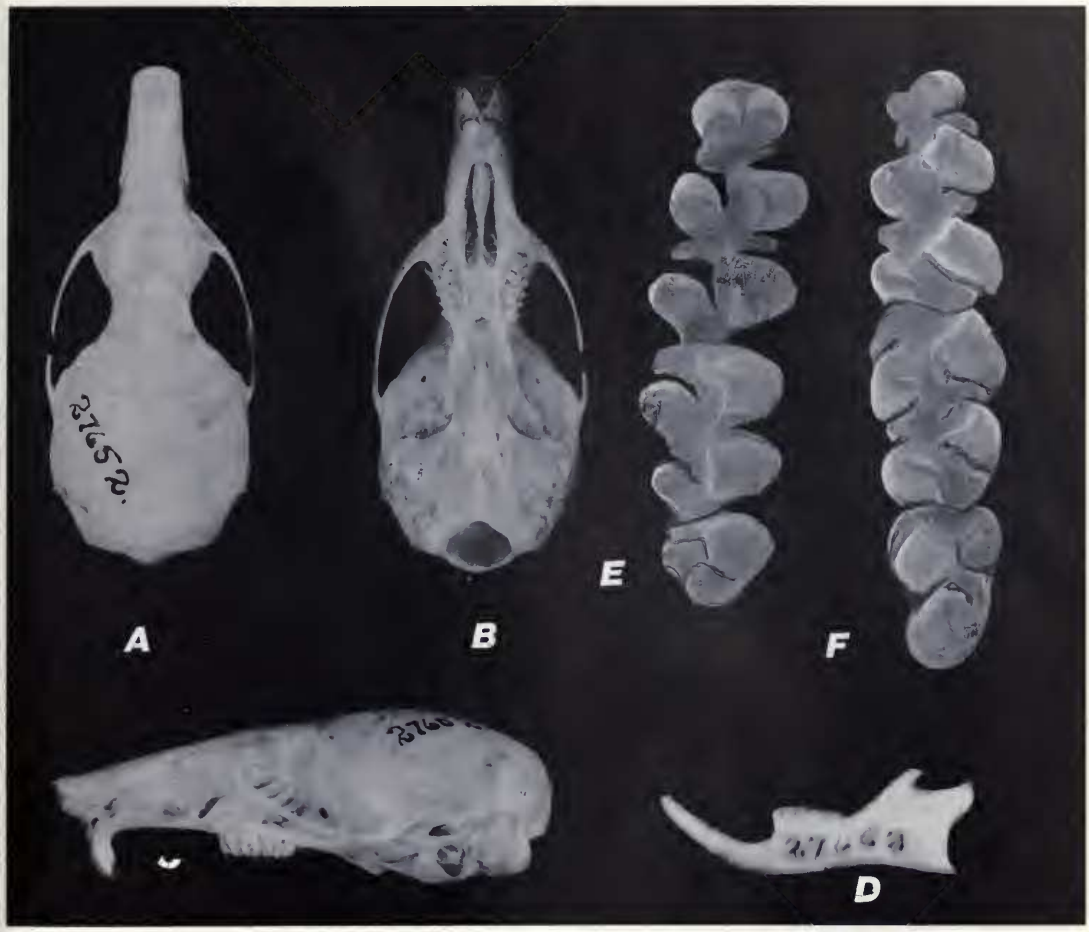


FIG. 19. *Oxymycterus nasutus.* Skull (**A, B, C, D**); molars, **E,** upper; **F,** lower (FMNH 27652♂); GSL = 33.3 mm; molars, 4.7. Maldonado, Uruguay.

morph of *O. paramensis jacentior."* Reig, 1987: 361—may be a variant of *paramensis.*

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 21.11.1.72, collected 8 May 1921, by E. Budin, no. 1465.

TYPE LOCALITY (Fig. 2)—Higuerilla, Valle Grande, Jujuy, Argentina; 23°35′S, 65°15W, 2000 m.

DISTRIBUTION—Known from type locality only. If conspecific with *Oxymycterus paramensis,* the range extends through the Andes from southeastern Peru (Puno) through Bolivia into northwestern Argentina (Jujuy).

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 116; T, 79; HF, 26 (su); E, 18.5; GSL, 31; CB, 27; ZB, 13.5; IB, 6; ML, 5.

REMARKS—The taxonomic status of medium-size *O. akodontius* is uncertain. It was originally described as dark-colored juvenal, size about as in *O. paramensis.*

Oxymycterus angularis Thomas (Fig. 14, molars)

Oxymycterus angularis Thomas, 1909:237–238. Vieira, 1953:216—BRAZIL: *Alagoas* (Mangabeira); measurements. Gyldenstolpe, 1932:131, 149—type data; measurements. Cabrera, 1961:466—listed; distribution. Reig, 1987:361—*angularis* and *roberti* "tentative" synonyms. Musser and Carleton, 1993:726—listed.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 3.10.1.56, collected 14 August 1903 by Alphonse Robert, no. 1706.

TYPE LOCALITY (Fig. 2). São Lourenço da Mata, Pernambuco, Brazil, 8°00′S, 35°03′W, 30 m.

FIG. 20. *Oxymycterus paramensis nigrifrons.* Molars, **A,** upper; **B,** lower (FMNH 52623); GSL = 31.2 mm; molars, 4.4. Limbani, Puno, Peru.

DISTRIBUTION—Coastal Brazil, in the states of Pernambuco and Alagoas.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 160; T, 100; HF, 30 (cu); E, 21; ML, 5.6; "of another specimen," GSL, 36.3; CB, 33; ZB, 17; IB, 7.1; ML, 5.6.

REMARKS—*Oxymycterus angularis,* a large species of the Brazilian bulge, needs comparison with Bahian *O. hispidus,* its nearest geographic ally. A series of seven specimens from Caruari, Pernambuco, inland from São Lourenço, the type locality, agrees with the description of *angularis* as well as with that of *hispidus.* The form of the zygomatic root or plate of *hispidus* as described by Thomas is difficult to visualize, but those of specimens at hand are not distinctive. A second series of five specimens from Viçosa, Alagoas, which agrees with the Pernambuco *angularis,* is less distant geographically from the *hispidus* type locality and fits the original description of *hispidus* as far as it goes.

Measurements of three specimens from Ceará at the top of the Brazilian bulge are smaller throughout than those of *angularis* or *hispidus.* They agree best with our referred medium-size *O. roberti* from Brasília.

Oxymycterus dasytrichus Schinz

Mus dosytrichos [sic] Schinz, 1821:288—prepublication of the original Wied-Neuwied (1826) description.

H[*ypudaeus*]. *dasytrichos* [sic], Wied-Neuwied, 1826: 425—BRAZIL: *Bahia* (Rio Mucurí, type locality).

Hypudeus dasytrichus, Tate, 1932b:17—name emended.

[*Oxymycterus*] *dasytrichus,* Musser and Carleton, 1993: 727—synonym of *O. rufus.*

Oxymycterus rufus dasytrichus, Cabrera, 1961:468—BRAZIL: *Bahia* (Rio Mucurí, type locality); *rostellatus* Wagner, a synonym; distribution.

LECTOTYPE—Skin mounted with skull in, American Museum of Natural History no. 559; lectotype selected by Avila Pires (1965, p. 15).

TYPE LOCALITY (Fig. 2)—Rio Mucurí (18°05′S, 39°34′W, sea level), Espírito Santo; a second specimen from nearby Camamú, Espírito Santo, received from Herr Freyreiss.

DISTRIBUTION—Known from type region only.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 10 ⅓″ (= 474 mm).

Oxymycterus delator Thomas

Oxymycterus delator Thomas, 1903a:489. Musser and Carleton, 1993:726, 727—compared with the "larger, rufescent *rufus* from Entre Rios." Reig, 1987: 361—distinction from *O. rufus* questioned. Voss and Linzey, 1981:14—morphology of male accessory glands.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 3.4.7.18, collected 24 October 1902 by William T. Foster, no. 880.

TYPE LOCALITY (Fig. 2)—Sapucay, Paraguay, 25°40′S, 56°55′W, 220 m.

DISTRIBUTION—Known only from the type locality.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 155; T, 106; HF, 26/28.5; GSL, 34.5; CB, —; ZB, 14; IB, 5.1; ML, 5.

REMARKS—Described as a very large uniformly blackish species. Musser and Carleton (1993, p. 726) compared it with "larger rufescent *O. rufus*

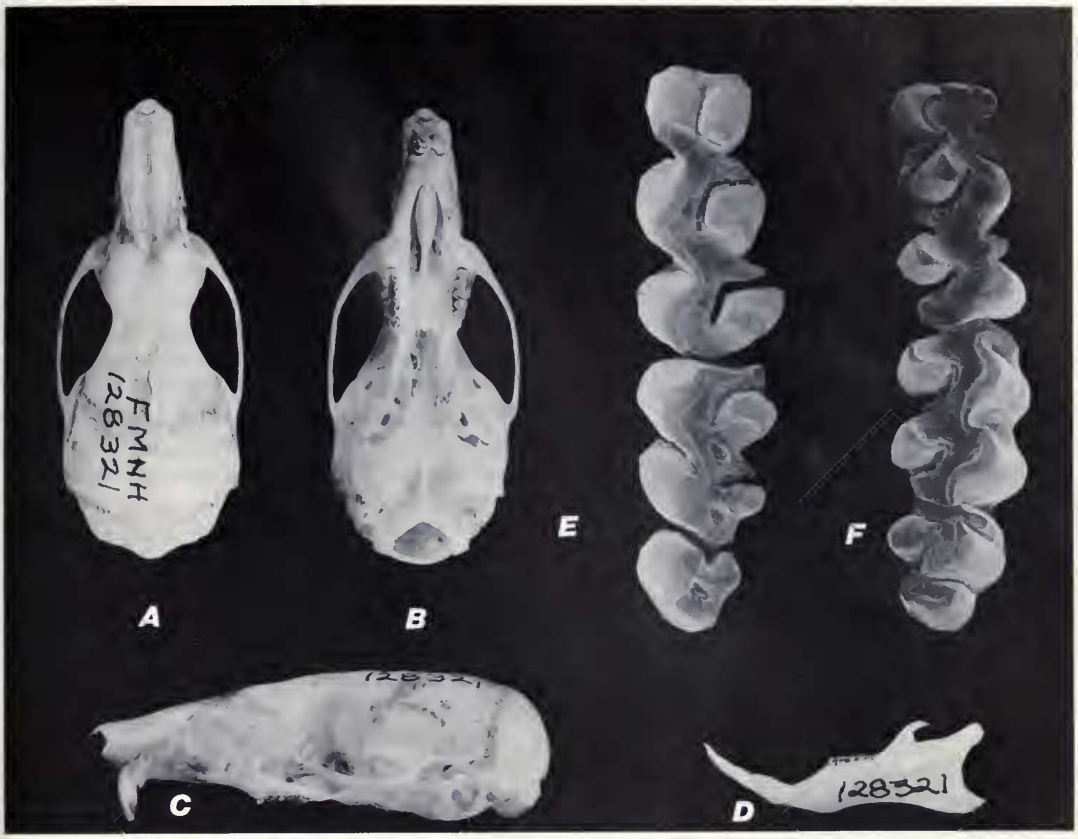


FIG. 21. *Oxymycterus roberti.* Skull (**A, B, C, D**); molars, **E,** upper; **F,** lower (FMNH 128321♂); GSL = 37.2 mm; molars, 4.1. Parque Nacional de Brasilia, D.F., Brazil.

from Entre Rios" without resolving its status as a species. The type measurements combine the body and tail measurements of a large species and the cranial and hindfoot measurements of a small one.

Correct appreciation of the coloration of *delator* requires special viewing conditions. The color, according to Thomas (1903a, p. 489), approximates Ridgeway's "clove-brown not rufous at all. This is when viewed from behind and above, but if the specimen is held between the light and the observer, with its nose toward him, its upper surface appears blackish with a purplish sheen . . . ." Obviously, *delator* is chromatically very variable.

Oxymycterus doris Thomas

Oxymycterus doris Thomas, 1916:478–479. Musser and Carleton, 1993:727—synonym of *O. inca.*

Oxymycterus inca doris, Cabrera, 1961:467—classification; distribution.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 2.1.1.95, collected 21 May 1901 by Perry O. Simons, no. 1441.

TYPE LOCALITY (Fig. 2)—Charuplaya, Río Securé, upper Río Mamoré, Cochabamba, Bolivia, 15°48′S, 66°30′W, 1350 m, 1400 m.

DISTRIBUTION—Known only from type locality. If conspecific with *Oxymycterus inca,* the range extends from central Peru (Junín) south into Cochabamba, Bolivia.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 150; T, 126; HF, 31 (su); E, 21; GSL, 37.5; CB, 32.5; ZB, 16; IB, 6.6; ML, 5.5.

REMARKS—Cabrera (1961, p. 467) holds that the large-size *doris* may be no more than a color phase of "*Oxymycterus inca iris* Thomas."

Oxymycterus hiska
Hinojosa, Anderson, and Patton (Fig. 15, skull)

Oxymycterus hiska, Hinojosa, Anderson, and Patton, 1987:4, 10, 14, Figs. 2, 3 (skull), Fig. 4 (molars). Musser and Carleton, 1993:726—listed.

HOLOTYPE—Adult female, skin, skull, body in alcohol, Museum of Vertebrate Zoology, University of California, no. 171519; five topotypes; collected 5 August 1985 by J. L. Patton, original number 12257.

TYPE LOCALITY (Fig. 2)—Yanahuaya, 14 km W, Puno, Peru, 14°19′S, 69°21′W, 2210 m.

DISTRIBUTION—Known from type locality only.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 100; T, 77; HF, 25 (cu); E, 16 (dry); CB, 25.10; ZB, 17.57; IB, 6.77; ML, 5.01.

REMARKS—The original description including measurements and figures of the skull indicates valid distinction of small *hiska* from small *hucucha.* A photograph of the paratype skull (MVZ 171578) is shown (Fig. 15).

Oxymycterus hispidus
Pictet (Fig. 17, molars)

Oxymycterus hispidus Pictet, 1843:37, Pl. 10 (animal), Pl. 11, Figs. 9–14 (skull, teeth, soles, palms). Pictet, 1843:212—characters. Leuderwaldt, 1929:27—BRAZIL: *São Paulo* (Ilha de São Sebastião). Vieira, 1953:143—BRAZIL: *São Paulo* (São Sebastião); *Rio de Janeiro* (Ilha Grande). Musser and Carleton, 1993:727—synonyms: *judex, misionalis, quaestor.*

Oxymycterus hispidus hispidus, Cabrera, 1961:466—classification; distribution.

O[*xymycterus*]. *hispidus,* Reig, 1987:361—"tentative" synonyms: *judex, misionalis, quaestor.*

H[*esperomys*]. (*Oxymycterus*) *hispidus,* Thomas, 1884:450—classification.

M[*us*]. *hispidulus* Schinz, 1845, 2:179—renaming of *Oxymycterus hispidus* Pictet mistakenly believed preoccupied by *Mus hispidus* Lichtenstein, 1828.

HOLOTYPE—Male, skin and skull (mounted?), in Musée d'Histoire Naturelle de Genéve, no. 275/47, received from M. Blanchet.

TYPE LOCALITY (Fig. 2)—Bahia, Brazil, 12°59′S, 38°31′W, sea level.

DISTRIBUTION—If conspecific with most large-size Atlantic Division species including *Oxymycterus rufus,* a senior synonym, the range of the *hispidus* group would extend from Alagoas and Pernambuco, Brazil (*angularis*), in the north, to Buenos Aires and Los Ríos, Argentina, in the south. The geographic variation, however, has not been studied.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 162; T, 115; HF, 34 (cu); E, 16 (dry).

REMARKS—Judged only by the original measurements and figures, *O. hispidus* may be the largest of the nine large Atlantic Division species of the genus. The figured skull measures about 36.9, crown length of upper molar row, 6.9. As depicted, the reddish brown upper parts of *hispidus,* the reddish head and cheek, comparatively dark underparts, reddish tail and upper surface of hands and feet, but more particularly the description in text, fit our Pernambuco series completely, especially MNR 321. Measurements of a blackish female from Bahia (Juquilá Tres Braços, USNM 545060) are HB, 157; T, 118; HF, 34; E, 24; GSL, 37.6; ML, 5.7.

The name *hispidus* has been widely used for the large *Oxymycterus* of eastern Brazil. It has also been treated as a junior synonym of *O. rufus* Fischer and as a senior synonym of *judex, misionalis, rostellatus,* and *quaestor.* Their holotypes or representatives await comparison with each other.

Oxymycterus hucucha
Hinojosa, Anderson, and Patton

Oxymycterus hucucha Hinojosa, Anderson, and Patton, 1987:15, Figs. 2, 3 (skull, Fig. 4 [molars]). Musser and Carleton, 1993:727—"Morphologically similar to *O. hiska.*"

HOLOTYPE—Adult male, skin, skeleton, tissues in liquid nitrogen, American Museum of Natural History no. 260583 (NK 12028, University of New Mexico), prepared by S. Anderson, 4 September 1984, field number 8176; two additional Bolivian specimens (1 from Totora, 20 mi E; 1 from Epizana, 101 km W, 2989 m).

TYPE LOCALITY (Fig. 2)—Comarapa, 28 km W (Santa Cruz) but in Cochabamba, Bolivia, 17°51′S, 64°40′W, 2800 m.

DISTRIBUTION—Known from type locality only.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 116+; T, 60+; HF, 23 (cu); E, 14; CB, 25.41; ZB, 13.01; IB, 5.39; ML, 4.26.

REMARKS—*O. hiska* was said to be "distinguishable from all previously described species by smaller size . . . ." *O. hucucha* was described in the same paper (p. 15) as slightly smaller than *O. hiska.*

Compared with *iheringi,* questionably an *Oxymycterus, hucucha* is about the same or slightly smaller in all dimensions.

[?]*Oxymycterus iheringi* Thomas

Oxymycterus nasutus, Hensel (not Waterhouse), 1873: 43, Figs. 19, 29 (molars)—BRAZIL: *Rio Grande do Sul.* Musser and Carleton, 1993:727—listed.

H[esperomys]. nasutus, Leche (not Waterhouse), 1886: 700, Figs. 29, 30 (molars)—BRAZIL: *Rio Grande do Sul.*

Oxymycterus iheringi Thomas, 1896, p. 308. Thomas, 1902a:62—BRAZIL: *Paraná* (Roça Nova, Serra do Mar, 100 m).

Oxymycterus iheringi, Massoia, 1963:129, Figs. 1–4 (skull)—ARGENTINA: Misiones (Tobunas, Ruta 14, km 352; Puerto Gisella); characters; comparisons; taxonomy; URUGUAY: *Canelones* (Arroyo Sarandí). Massoia and Fornes, 1969:315, Fig. 1 (animal), Fig. 2 (palate), Fig. 3 (molars); taxonomic history; characters; comparisons with *O. nasutus.* Musser and Carleton, 1993:727—listed.

M[icroxus]. iheringi, Thomas, 1909:237—classification.

Microxus (?) *iheringi,* Gyldenstolpe, 1932:134—listed.

Microxus iheringii [sic] Vieira, 1953:145—BRAZIL: *Rio Grande do Sul* (São Lourenço). Massoia, 1963: 135—Vieira's identifications questioned.

Akodon (*Microxus*) *iheringi,* Cabrera, 1961:458—classification; distribution.

HOLOTYPE—Female, skin and skull, British Museum (Natural History) no. 86.9.16.8, collected by Hermann von Ihering.

TYPE LOCALITY (Fig. 2)—Taquara do Mundo Novo, Rio dos Sinos (Linos), Rio Grande do Sul, Brazil, 29°39′S, 50°47′W, 29 m.

DISTRIBUTION—Known with certainty only from type locality; recorded from Paraná, Brazil, Uruguay, and Misiones, Argentina.

ORIGINAL MEASUREMENTS OF ♀ HOLOTYPE—HB, 100; T, 94; HF, 23.5 (su); E, 16.7; CB, 24.7; IB, 6; ML, 4.2.

REMARKS—The claws, both manual and pedal, of referred specimens of *O. iheringi* are small, almost wispy, and partially hidden by long hairs. This may account, in large part, for exclusion by some authors of *iheringi* from the genus *Oxymycterus.* The status of the species and related newly collected material is presently under study. Retention of the species in the genus *Oxymycterus* is to be considered provisional.

Oxymycterus inca Thomas

Oxymycterus inca Thomas, 1900:298. Musser and Carleton, 1993:727—Emmons and Feer (1990) identification of "Amazon Basin" long-nose form questioned; synonyms: *doris, iris, juliacae.*

Oxymycterus inca inca Cabrera, 1961:467—classification; distribution; *doris, iris, juliacae* listed as subspecies.

Oxymycterus incae [sic], Reig, 1987:361—*inca, doris, iris, juliacae* recognized as subspecies.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 0.7.7.45, collected 10 April 1900 by Perry O. Simons, no. 925.

TYPE LOCALITY (Fig. 2)—Perené, Junín, Peru, 10°58′S, 75°13′W, 800 m.

DISTRIBUTION—Known from type locality only in central Peru. If combined with its ascribed junior synonyms (*doris, iris, juliacae*), the range would extend from central Peru south through the Andes into Cochabamba, Bolivia; altitudinal range from about 800 m (Perené, Peru) to about 1900 m (*juliacae,* Peru).

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 135; T, 105; HF, 30/33; E, 21; GSL, 35; ZB, 18; IB, 6.7; ML, 5.7.

REMARKS—This is the large-size-class species of the Andean Division.

Oxymycterus iris Thomas

Oxymycterus iris Thomas, 1901:183.

Oxymycterus inca iris, Cabrera, 1961:467—distribution; "may be no more than a color phase of *inca.*"

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 1.1.1.76, collected 5 September 1900 by Perry O. Simons, no. 1218.

TYPE LOCALITY (Fig. 2)—San Ernesto, Mapiri, upper Río Beni, La Paz, Bolivia, 10°23′S, 65°24′W, 1000 m.

DISTRIBUTION—Known from type locality only but see *Oxymycterus inca,* above.

ORIGINAL MEASUREMENTS OF HOLOTYPE. HB, 160; T, 102; HF, 30/33; E, 22; GSL, 37; IB, 6.5; HL, 5.7.

Oxymycterus paramensis jacentior Thomas

Oxymycterus paramensis jacentior Thomas, 1925:580. Thomas, 1926:323—BOLIVIA: *Tarija* (Pino), 1800 m.

[*Oxymycterus*] *paramensis jacentior,* Yepes, 1935: 232—ARGENTINA: *Salta.*

Oxymycterus paramensis jacentior, Cabrera, 1961: 467—classification; distribution.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 25.2.1.49, collected 2 August 1924 by Emilio Budin, no. 1772.

TYPE LOCALITY (Fig. 2)—Caraparí, Yacuiba, Tarija, Bolivia, 21°49′S, 63°46′W, 1000 m.

DISTRIBUTION—Known only from Tarija Department, southern Bolivia, between 1000 and 1800 m.

ORIGINAL MEASUREMENTS AND HOLOTYPE—HB, 146; T, 119; HF, 28 (su); E, 198; GSL, 36.2; CB, 32.6; ZB, 16.8; IB, 6; ML, 5.

REMARKS—The condylobasal length 32.6 places the holotype with the large-size group of Andean hocicudos (Table 1). All other dimensions, however, and its classification as a subspecies of *O. paramensis* point to a medium-size species. The holotype, an "old male," was described as slightly larger "than typical *paramensis*," its "skull rather larger and heavier."

Oxymycterus judex Thomas

Oxymycterus judex Thomas, 1909:238. Gyldenstolpe, 1932:131, Pl. 16, Figs. 1–1b (skull), Fig. 18 (upper molars)—BRAZIL: *Santa Catarina*, Stockholm Museum. Musser and Carleton, 1993:727—synonym of *O. hispidus*.

Oxymycterus hispidus judex, Cabrera, 1961:466—classification; distribution.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 9.11.19.23, collected by W. Ehrhardt, no. 21.

TYPE LOCALITY (Fig. 2)—Joinville, Santa Catarina, Brazil, 26°18′S, 48°50′W, sea level.

DISTRIBUTION—Known from type locality only, but see *Oxymycterus hispidus*, above.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 152; T, 129; HF, 34.5; E, 22.5; GSL, 42; ZB, 17.6; IB, 6.8; ML, 5.8.

REMARKS—*Oxymycterus judex* was described as "most nearly allied to *O. quaestor* but is distinguished by the larger size and much larger brain case." Separation of the forms by Thomas was based on measurements of a representative each of the two taxa from the same region, one being insignificantly larger than the other. Cabrera reclassified them as subspecies without direct comparison.

Oxymycterus juliacae J. A. Allen (Fig. 18, skull, molars)

Oxymycterus juliacae J. A. Allen, 1900:223. Thomas, 1901a:189—PERU: *Puno* (Río Inambari). Thomas, 1902b:140—BOLIVIA: *Cochabamba* (Charuplaya, 1350 m). Sanborn, 1951:23—PERU: *Cuzco* (Hacienda Cadena). Sanborn, 1953:6—PERU: *Puno* (Sandia). Goodwin, 1953:322—type history.

[*Oxymycterus*] *juliacae*, Musser and Carleton, 1993: 727—a synonym of *O. inca*.

Oxymycterus inca juliacae, Cabrera, 1961:467—classification; distribution.

HOLOTYPE—Male, skin and skull, American Museum of Natural History no. 15804, collected 29 November 1899 by H. H. Keays, no. 12.

TYPE LOCALITY (Fig. 2)—Inca Mines, Santo Domingo, upper Río Inambari, Puno, Peru, 15°30′S, 70°08′W, 1875 m.

DISTRIBUTION—Andes of southern Peru, in Puno and Cuzco, south into Cochabamba, Bolivia. In effect, the same range as that of *Oxymycterus inca* Thomas, 1900.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 138; T, 112; HF, 29/32; E, 16; E, dry, 13; GSL, 36.4; ZB, 16; IB, 6.7; ML, 8.

REMARKS—Published measurements of *O. juliacae* agree with those of *O. inca* except the molar row is given as 8 mm. This length exceeds any other known for *Oxymycterus*. The largest for any other holotype is 5.8 mm, in this case *O. judex* and *O. quaestor*. The largest molar row measured in this study, 6.4 mm, is that of a specimen from Carucari, Pernambuco, a near topotype of *O. angularis*.

Oxymycterus misionalis Sanborn

Oxymycterus misionalis Sanborn, 1931:1. Sanborn, 1947:250—type history. Carleton, 1973:15—stomach morphology. Musser and Carleton, 1993:727—synonym of *O. hispidus*.

Oxymycterus hispidus misionalis, Cabrera, 1961:466—classification; distribution.

HOLOTYPE—Female, skin and skull, Field Museum of Natural History no. 26756, collected 15 September 1926 by Colin C. Sanborn, no. 1242.

TYPE LOCALITY (Fig. 2)—Río Parana-í, affluent of Río Paraná, about 100 mi S Río Iguassú, Misiones, Argentina, 26°37′S, 54°46′W, 100 m.

DISTRIBUTION—Known from type locality only but see *Oxymycterus hispidus*, above.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 174; T, 143; HF, 36; E, —; GSL, 42.8; CB, 38.5; ZB, 17; IB, 6.2; ML, 5.7.

O. misionalis may indeed be conspecific with *hispidus,* or more likely *rufus,* the older name.

Oxymycterus nasutus (Fig. 19, skull, molars)

Mus nasutus Waterhouse, 1837:16. Waterhouse, 1839: 56, Pl. 17, Fig. 2 (animal), Pl. 33, Fig. 7 (skull, dentition).

Mus (*Oxymycterus*) *nasutus,* Waterhouse, 1837:31—classification.

Holochilus nasutus, Gray, 1843:114—BRAZIL.

Hesperomys nasutus, Burmeister, 1879:214 (part)—BRAZIL: *Rio de Janeiro* (Novo Friburgo). Figueira, 1894:18—URUGUAY: common everywhere.

Hesperomys (*Oxymycterus*) *nasutus,* Thomas, 1884: 450—classification. Ihering, 1892:109—BRAZIL: *Rio Grande do Sul*; characters. Ihering, 1894:20—BRAZIL: *São Paulo.*

H[*esperomys* (*Oxymycterus*)] *nasutus,* Ihering, 1885: 424—BRAZIL; characters.

Oxymycterus nasutus, Pelzeln, 1883:74—BRAZIL: *São Paulo* (Ypanema). Vorontsov, 1979:20, 41, 95, 184, 234, 277, 281, Fig. 100 (stomach), Fig. 125 (intestine). Musser and Carleton, 1993:727—listed; distribution.

O[*xymycterus*] *nasutus,* Thomas, 1901b:531—range from Uruguay into *Rio Grande do Sul,* Brazil. Thomas, 1914:244—URUGUAY: La Plata estuary (type locality); BRAZIL: *Rio Grande do Sul.* Sanborn, 1929:157—URUGUAY: *Maldonado* (Maldonado; 15 km N of San Carlos); *San José* (Arazati). Vieira, 1953:143—part, BRAZIL: *Paraná* (Castro); *São Paulo* (Campos do Itatiaia). ARGENTINA: *Entre Rios*; measurements questionable.

Oxymycterus nasutus, Musser and Carleton, 1993: 717—listed.

[*Hesperomys* (*Oxymycterus*) *rufus*], Trouessart (part), 1881:142—classification.

Oxymycterus rufus nasutus, Cabrera, 1961:469—classification; distribution.

HOLOTYPE—Skin and skull, British Museum (Natural History) no. 55.12.24.176, collected by Charles R. Darwin on the voyage of the Beagle.

TYPE LOCALITY (Fig. 2)—Maldonado, Uruguay, 34°54′S, 54°57′W, sea level.

DISTRIBUTION—From La Plata Estuary north through Uruguay, Paraguay, and southeastern Brazil in the States of Rio Grande do Sul, Santa Catarina, and Paraná.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 131; T, 68; HF, 26.5.

REMARKS—*Oxymycterus nasutus* is the small-size species sympatric with the large *rufus* (or *hispidus*) throughout Uruguay, Paraguay, southeastern Brazil, and the La Plata estuary region in Argentina. The species had been treated mistakenly as a synonym of *O. rufus* by Hershkovitz (1959, p. 339).

Oxymycterus paramensis nigrifrons Osgood (Fig. 20, molars)

Oxymycterus paramensis nigrifrons Osgood, 1944:197. Sanborn, 1947:250—type history. Sanborn, 1950: 15—PERU: *Puno* (Limbani); BOLIVIA: *La Paz* (Nequejahuira; Río Aceramarca; Cocopunco; Okara; Tacacama). Cabrera, 1961:468—distribution.

HOLOTYPE—Female, skin and skull, Field Museum of Natural History no. 52629; collected 29 September 1941 by Colin C. Sanborn, no. 2743.

TYPE LOCALITY (Fig. 2)—Limbani, Puno, Peru, 14°08′S, 69°42′W, 2810 m.

DISTRIBUTION—Andes of southern Peru and northern Bolivia pending comparison with *O. paramensis* (*s.s.*) and *O. p. jacentior.*

ORIGINAL MEASUREMENTS OF HOLOTYPE—"Average of eight adult topotypes": TL, 235; T, 90; HF, 30; GSL, 32.7; ZB, 14.3; IB, 6.3; ML, 5.

REMARKS—The name of the taxon is derived from a supranarial blackish patch "uniformly present and has not been found in any other form examined except in very incipient form." The tip of the snout is indeed blackish in all 24 specimens of the type series and also in nearly every specimen of *Oxymycterus* I have examined from throughout the range of the genus. Holotype and topotype of *O. amazonicus* at the northeastern extreme of the generic range are as well marked with a rostral stripe as any *nigrifrons* from Limbani, Peru. Separation from *juliacae* or *paramensis* (*s.s.*) may be questioned.

Oxymycterus paramensis Thomas

Oxymycterus paramensis Thomas, 1902b:139—BOLIVIA: *Cochabamba* (Choquecamate; Alicuni, 2600 m; Choro, 3500 m); local name huacucha. Thomas, 1918:188—ARGENTINA: *León; Jujuy;* local name, hocicudo; agrees with type series in every detail. Yepes, 1933:48—ARGENTINA: *Salta* (Aguarau, 700 m). Hooper and Musser, 1964:28, Fig. 5 (glans penis)—description of glans, baculum. Musser and Carleton, 1993:727—listed; synonyms: *nigrifrons, jacentior.*

O[*xymycterus*] *paramensis,* Thomas, 1925:580—PERU: *Cuzco* (Ollantaytambo); ARGENTINA: *León; Jujuy.*

Oxymycterus paramensis paramensis, Gyldenstolpe, 1932:130—"most closely allied to *O. roberti.*" Cabrera, 1961:468—classification; distribution.

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 2.1.1.90, collected 15 July 1901 by Perry O. Simons, no. 1504.

TYPE LOCALITY (Fig. 2)—Choquecamate, upper

Río Securé, Cochabamba, Bolivia, 16°55′S, 66°37′W, 4000 m.

DISTRIBUTION—Andes, from Puno, Peru, throughout Cochabamba, Bolivia, into northwestern Argentina in the departments of Tarija, Jujuy, and Salta.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 130; T, 102; HF, 25/27.5; E, 18; GSL, 32.5; ZB, 14.2; IB, 5.6; ML, 4.9.

REMARKS—*Oxymycterus paramensis* may be the medium-size species sympatric with the larger *O. inca* throughout most of its range.

Oxymycterus platensis

Oxymycterus platensis Thomas, 1914:244. Thomas, 1917:100—ARGENTINA: *Buenos Aires* (Isla Ella, delta of Río Paraná). Massoia, 1961:124—ARGENTINA: *Buenos Aires* (Punta Lara, Río de La Plata); habits; measurements.

O[*xymycterus*]. *platensis,* Reig, 1987:861—may be subspecies of *O. rufus.* Carleton, 1973:15, stomach morphology.

[*Oxymycterus*] *platensis,* Musser and Carleton, 1993: 727—synonym of *O. rufus.*

Oxymycterus rufus platensis, Cabrera, 1961:469—classification; distribution. Crespo, 1962:116—ARGENTINA: *Buenos Aires* (Azul).

Oxymycterus rutilans platensis Massoia and Fornes, 1969:316—ARGENTINA: habits; reproduction. Crespo, 1964b:62—ARGENTINA: *Córdoba* (Yacambo). Crespo, 1964a:101—ARGENTINA: *Buenos Aires* (Abra de Ventana; Tornquist, 500 m). Massoia and Fornes, 1964:30—ARGENTINA: *Buenos Aires* (Delta del Paraná); in owl pellets; local name *hocicudo rojuzochico.*

HOLOTYPE—Male, skin and skull, British Museum (Natural History) no. 99.10.4.1, collected 24 June 1896 by C. Spegazzini.

TYPE LOCALITY (Fig. 2)—Ensenada, Río Santiago, La Plata, Buenos Aires, Argentina, 34°51′S, 57°55′W, sea level.

DISTRIBUTION—States of Buenos Aires and Córdoba, Argentina.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 140; T, 111; HF, 28 (su); E, 16.5; GSL, 36; CB, 33.2; ZB, 17.2; IB, 6.2; ML, 5.4.

REMARKS—Treatment of *platensis* as a synonym or subspecies of *Oxymycterus rufus* is arbitrary.

Oxymycterus quaestor Thomas

Oxymycterus quaestor Thomas, 1903b:226—BRAZIL: type; *Santa Catarina; Rio de Janeiro* (Terezopolis). Davis, 1945:280—BRAZIL, reproduction. Vieira, 1953:144—BRAZIL: *São Paulo* (Icatu, Estrada Noroeste; Paranapema); measurements.

Oxymycterus hispidus quaestor Cabrera, 1961:467—classification; distribution. Carvalho, 1965:251—BRAZIL: *São Paulo* (Boracéia).

O[*xymycterus*]. *quaestor,* Carleton, 1973:15—stomach morphology.

[*Oxymycterus*] *quaestor,* Musser and Carleton, 1993: 727—synonym of *O. hispidus.*

Oxymycterus questor [sic], Gyldenstolpe, 1932:131—characters; measurements of holotype.

HOLOTYPE—Female, skin and skull, British Museum (Natural History) no. 3.7.1.80, collected 2 November 1901 by Alphonse Robert, no. 892.

TYPE LOCALITY (Fig. 2)—Roça Nova, Serra do Mar, Paraná, Brazil, 25°30′S, 48°50′W, 1000 m.

DISTRIBUTION—Southeastern Brazil in the States of Rio de Janeiro, São Paulo, Paraná, and Santa Catarina.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 140; T, 100; HF, 30/34; E, 22; GSL, 39.5; ZB, 16.2; IB, 6.1; ML, 5.8.

REMARKS—*Oxymycterus quaestor* has been classified by Cabrera (1961, p. 467) as a subspecies of *O. hispidus,* but evidence for this decision was not forthcoming.

Oxymycterus roberti Thomas (Fig. 21, skull, molars)

Oxymycterus roberti Thomas, 1901b:530. Avila Pires, 1960:39 (part), fig. p. 45 (skull)—BRAZIL: *Minas Gerais* (Conçeicáo do Mato Dentro, NNE Lagôa Santa); characters, taxonomy; *Oxymycterus rufus* Winge (not Fischer), a synonym. Cabrera, 1961: 468—distribution. Musser and Carleton, 1993:727—listed; distribution.

HOLOTYPE—Male, skin and skull, British Museum (Natural History), no. 1.11.3.51, collected 5 July 1901 by Alphonse Robert, no. 741.

TYPE LOCALITY (Fig. 2)—[Paranahyba], Rio Jordão, southwestern Minas Gerais, Brazil, 18°26′S, 48°00′W, 700–900 m.

DISTRIBUTION—In Brazil, western Minas Gerais, Goiás, and Distrito Federal.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 127; T, 110; HF, 30/33; ear, 22; bregma to nasal tip, 26; ZB, 15.3; IB, 6.7; ML, 5.2.

REMARKS—*Oxymycterus roberti* appears to be a well-defined species intermediate between the large- and small-size hocicudos.

Oxymycterus rostellatus Wagner

Hesperomys (*Oxymycterus*) *rostellatus* Wagner, 1842: 361. Wagner, 1843:44—English translation of the original description.

H[*esperomys*]. *rostellatus,* Wagner, 1843:514, Pl. 202A (animal)—BRAZIL.

Oxymycterus rostellatus, Giebel, 1857:191, Pl. 5, Fig. 4 (skull)—osteology. Gyldenstolpe, 1932:128—characters; type said to be in "Naturhis. Museum, Vienna, no. 420 ♀." Vieira, 1953:144—BRAZIL: *São Paulo* (Butantán).

[*Oxymycterus*] *rostellatus,* Musser and Carleton, 1993: 727—synonym of *rufus.*

Oxymycterus rosettellatus [sic], Vorontsov, 1979:95, Fig. 47 (upper molars)—alimentary tract.

[*Hesperomys* (*Oxymycterus*) *rufus*] *rostellatus,* Trouessart, 1881:142—classification.

HOLOTYPE—According to Wagner (1842, p. 361) who described the animal, the holotype is in the Munich Zoological Museum, purchased from Brandt. Gyldenstolpe (1932, p. 128) says the type, a female, is in the Vienna Natural History Museum, no. 420.

TYPE LOCALITY (Fig. 2)—"Brasilia"; restricted by Gyldenstolpe (1932, p. 128) to Bahia, this can be São Salvador, or Salvador, Bahia, Brazil, 12°59′S, 38°31′W, sea level.

DISTRIBUTION—Eastern Brazil.

ORIGINAL MEASUREMENTS OF HOLOTYPE—HB, 5″ 3‴ (163); T, 3″ 10‴ (80 mm).

REMARKS—The name *rostellatus* Wagner has been used reservedly not only because of questions regarding the status of the older name *dasytrichus* but also because of the questionable type locality ascribed to *rostellatus.* Authors have found such names as *hispidus, rufus,* and *quaestor* more convenient if not more appropriate geographically. A future reviser of the genus may locate the holotype of *rostellatus.*

In a comparison of *Oxymycterus quaestor* with a speciman said to be "*O. rostellatus* Wagner, from Brazil," Thomas (1903b, p. 227) described its "posterior nares [as] level with the back of the second molar," an extreme condition.

Oxymycterus rufus Fischer

Rat cinquième ou rat roux, Azara, 1801, 2:94—French translation of original Spanish description.

Hocicudo Azara, 1802:80—Original Spanish description. Azara, 1809:328—travels.

Le rat roux du Paraguay, Desmarest, 1804:24—version of original French description.

Mus rufus Fischer, 1814:71. Desmarest, 1819:62—name based solely on the rat *roux* of Azara. Desmarest, 1822:305—PARAGUAY. Rengger, 1830: 230—PARAGUAY (Asunción); characters. Tate, 1932a:1—*rat roux* of Azara, an *Oxymycterus.*

M[*us*]. *rufus,* Brants, 1827:142—characters; synonymy.

Mus rufus, Langguth, 1966:285—*M*[*us*]. *rufus* Fischer, 1814 (p. 21) available for the *rat roux* of Azara.

Hesperomys rufus, Burmeister, 1954:183—characters; taxonomy; *Mus fossorius* Lund a synonym.

H[*esperomys*]. *rufus,* Bertoni, 1914:73—PARAGUAY: Puerto Bertoni.

H[*esperomys*]. *rufus,* Ihering, 1885:424—baculum.

[*Hesperomys* (*Oxymycterus*)] *rufus,* Trouessart, 1881: 142.

H[*esperomys*]. (*Oxymycterus*) *rufus,* Thomas, 1884: 450—classification.

Hesperomys (*Oxymycterus*) *rufus,* Ihering, 1894:21—BRAZIL: *São Paulo.* Tullberg, 1900:249, Pl. 56 (foot), Pl. 15 (skull), Pl. 28 (molars), Pl. 30 (scapula), Pl. 36 (palate), Pl. 41 (stomach), Pl. 45 (intestine)—characters. Yepes, 1938:53—part, distribution. Vieira, 1953:145—part, BRAZIL: *São Paulo* (Perus; São Sebastião).

Oxymycterus rufus, Pelzeln, 1883:75—BRAZIL: *São Paulo* (Itararé). Winge, 1888:36, Pl. 1, Figs. 10, 11 (head, hind foot), Pl. 2, Fig. 14 (skull)—BRAZIL: *Minas Gerais* (Lâgoa Santa, Recent and Pleistocene); characters; comparisons; measurements. J. A. Allen, 1916:572—BRAZIL: *Matto Grosso* (Campos Novos). Shufeld, 1926:563, Pl. 1, Fig. 2, Pl. 3, Fig. 8—BRAZIL: *Santa Catarina,* characters; osteology. Yepes, 1938:53—part, distribution. Vieira, 1953:145—part, BRAZIL: *Santa Catarina* (Colonia Hansa). Hooper and Musser, 1964:291—glans penis. Vorontsov, 1979:20, 41, 231, Fig. 100 (stomach)—alimentary tract, morphology, function. Musser and Carleton, 1993:727—synonyms: *dasytrichus, platensis, rostellatus, rutilans.*

O[*xymycterus*]. *rufus,* Thomas, 1914:244—ARGENTINA: *Corrientes* (Goya specimens regarded as typical). Yepes, 1935:232—ARGENTINA: *Entre Rios; Corrientes.*

Oxymycterus rufus rufus, Cabrera, 1961:469—classification.

Oxymycterus rutilans, Hershkovitz, 1959:339—*nasutus* Waterhouse regarded a synonym. Vaz-Ferreira, 1960:66—URUGUAY: *Lavallega; Maldonado;* near streams and bañados. Reig, 1964:213—ARGENTINA: *Buenos Aires* (General Pueyrredón; Mar Chiquita; Baliza San Andres; Arroyo Brusquitas; Arroya Corrientes), population dynamics; habitats; diet. Reig, 1965:208—ARGENTINA: *Buenos Aires* (SE coast); associations; embryos (avg. 4). Reig, 1965:213—ARGENTINA: *Buenos Aires* (Arroyo Brusquitas; Arroyo Lobería; Baliza Cantú; Arroyo Corrientes; Baliza San Andrés; Petit Hotel; Arroyo Chapadmalal; Santa Clara del Mar; Serra La Perigrina; Laguna de los Padres); population fluctuations; habits; habitat. Voss and Linzey, 1981:14—male accessory glands, morphology.

[*Mus*?] *rutilans* Illiger, 1815—nomen nudum.

M[*us*]. *rutilans* Olfers, 1818:209—characters.

O[*xymycterus*]. *rutilans,* Carleton, 1973:15, Fig. 5 (stomach)—stomach morphology.

Oxymycterus nasutus Bertoni (not Waterhouse), 1914:

73—PARAGUAY. Vieira, 1953:143—ARGENTINA; *Entre Rios;* measurements.

[*Oxymycterus*] *nasutus* Yepes (not Waterhouse), 1935: 232—ARGENTINA: *Entre Rios* (Yaguarasapa); local name *anguya pittha.*

HOLOTYPE—Not known to be in existence, name based on the *rat cinquième ou rat roux* of Azara.

TYPE LOCALITY (Fig. 2)—"Paraguay," in the original description, but the hocicudo (i.e., the *rat roux* of the French edition) was said to have been found at 32°30′S in the Río Paraná drainage system; this restricts the type locality to northern Entre Rios, Argentina.

DISTRIBUTION—Recorded as *rufus* and *rutilans* from Paraguay and Uruguay and in Brazil from Santa Catarina, Mato Grosso, occasionally from São Paulo, and Minas Gerais; if conspecific with *Oxymycterus hispidus,* its geographic distribution becomes the same (p. 30).

ORIGINAL MEASUREMENTS OF FIRST TYPE—TL, 8½″ (230); T, 3½″ (95); HF, 13‴ cu (35.2); second type, TL, 9¼″ (250).

REMARKS—The original description of *rufus,* the *rat cinquième ou rat roux,* was based on a large individual preserved in brandy and presented to Azara (1801, p. 94) by his friend Nosédo. Place of capture was not given. The hocicudo or long-nose rat of the *Apuntamientos,* Azara's (1802, p. 80) original Spanish account of the translated French version, was shot by Azara about 9:00 A.M. while shotgun fishing along a stream at 32°30′S in the Río Paraná basin. The mouse was spied eating a piece of meat Azara had casually thrown away and which landed at the entrance to the rodent's nest. Azara added that another specimen preserved in spirits was brought to him by his friend Nosédo. It was said to be indistinguishable from the first in size, proportions, and coloration.

Although the name *Oxymycterus rufus* is based on Azara's *rat roux,* the locality 32°30′S belongs to its conspecific of the Spanish account. To avoid strife and confusion, the point 32°30′S is herewith transferred to the *rat roux* and becomes, as it has been, the type locality.

A dominantly reddish, large-size hocicudo from Entre Rios, Argentina, has not been seen by me in the course of this study. This leaves moot the question of relationship between *Oxymycterus rufus* and the next older named *O. hispidus.* Either or both names have been regarded as available for the large-size coastal hocicudo. The reddish color ascribed to the original specimen of *O. rufus* is an erythricism of common occurrence in many populations that may also include melanistic individuals. Notwithstanding, nine names (Table 1) have been erected for the large-size Atlantic Division hocicudo. Most of them, however, are now regarded as synonyms of *O. hispidus* for lack of better knowledge of *O. rufus* or *O. hispidus.*

Habits and Habitat

What is known of habitat and behavior of the 23 forms of hocicudos, or long-nose mice (also hog-nose mice), is derived from observations of the large-size *Oxymycterus rufus* (or *hispidus*), the medium-size *O. roberti,* and the smaller *O. nasutus,* all of the Atlantic Division, and the medium-size *O. paramensis* of the Andean Division.

Borchert and Hanson (1983) observed the effects of fire and flooding on the small mammals of the *cerrado* or scrub savanna of Brasília, D.F., in central Brazil. *Oxymycterus roberti* was one of seven sigmodontine species live-trapped in the valley side wet *campo,* also known as *campo limpo* or *brejo,* a formation of grasses, sedges, and shrubs. These wet *campos* may flood seasonally on a small scale, or are permanently flooded. Captures were 42% *Bolomys lasiurus* ("*Zygodontomys lasiurus*"), 31% *Oxymycterus roberti,* 20% "*Plectomys paludiocola,*" a nomen nudum later described as *Akodon lindberghi.* Also captured were *Oligoryzomys eliurus, Akodon arviculoides* [= *A. cursor*], and *Calomys callosus.*

The preferred habitat of *Oxymycterus roberti* was the wet *campo.* It was also taken in grassy margins along the wet *campo* transition and wet *campo*–gallery forest border. Borchert and Hanson never captured the mouse in gallery forest. They found *O. roberti* equally abundant on burned and untouched areas. The examined stomachs contained 74% insects, earthworms, and termites. The population density of *O. roberti* fluctuated least of the three most abundant species mentioned above. Activity was about equally nocturnal and diurnal where fire had not destroyed the cover.

Lacher et al. (1989) studied the structure of a small mammal community in two contiguous but floristically different savannas in the same *cerrado* worked by Borchert and Hanson. The drier grassland, they found, had fewer species and 38% of the overall population density of the more humid grassland. Microhabitat generalist *Bolomys lasiurus* was abundant in both formations. The microhabitat specialist *Oxymycterus roberti* preferred the more humid habitats with soft soil and thicker grass cover.

An investigation of *Oxymycterus roberti* pre-

dation on eight species of *cerrado* termites was made by Redford (1984). It was shown that most hocicudos preferred termite species with soldiers whose defense was mandibular biting but with some chemical backup. Least preferred were termites depending entirely on chemical defense. Species classified as intermediate in preference used both defenses.

Oxymycterus roberti was called a burrowing mouse by Redford, following a long tradition of vernacular usage by mammalogists. I saw no signs of burrowing by *Oxymycterus* when trapping this species and other sigmodontines in the same area.

A 7-month study of recapture of small mammals in the same habitat by Nitikman and Mares (1987:85) took into account two species of small marsupials and eight sigmodontine rodents, including *Oxymycterus roberti.* The five individuals of this species captured were described as characteristic residents of *brejos,* the permanently inundated savanna that borders gallery forest.

> None of the marked animals seemed to be resident in the study area. Three were caught only once and none was caught in more than one trapping period. All but one capture was made in part of the grid dominated by bracken fern; one individual was caught inside gallery forest. Captures were made in four of the seven months of the study. The species however was scarce during both wet seasons.

Other workers, including myself, found *Oxymycterus* abundant at all times.

The big reddish hocicudo, *Oxymycterus rufus,* of Buenos Aires Province, observed by Reig (1964) was found in every habitat type whether meadow, tall grass, woodland, streamside, or rocky outcroppings. The population density fluctuated considerably throughout Reig's investigations. Censused together with *Akodon azarae,* it peaked at 84% of total captures of small mammals of the study area. In January, however, the *O. rufus* population dropped to 64.7% of captures, that of *A. azarae* to 24.4%. Trapping was in open and wooded areas. In more humid sites, the catch was 58.7% for *O. rufus* and 33.3% for *A. azarae.* Retrapping the first locality in April yielded 41.8% for *O. rufus* and 41.1% for *A. azarae.* In another area at about the same time, the population density of *O. rufus* was 13%, whereas *A. azarae* abounded at 69.5%. The cause or significance of the contrasting densities was not explained, but habitat and resource utilization of the two species are different. Stomach contents of *O. rufus* consisted mostly of mollusks, earthworms, myriopods, and bits of rodents. The diet of *A. azarae,* in contrast, is mostly herbivorous.

The behavior of *Oxymycterus rufus* at Punta Lara, Buenos Aires, Argentina, was closely followed by Kravetz (1973). It was most abundant where cover was densest, a logical correlation. Maximum population density occurred in winter, minimum in summer (February). Breeding began late in September and continued into May. Most of the population was renewed annually. Activity was mostly nocturnal with a peak between 17 and 21 hr, another between 3 and 9 hr. The sigmodontines captured in a bamboo patch with an area of 3200 square meters were 67 *Oxymycterus rufus,* 16 *Scapteromys tumidus,* 13 *Akodon azarae,* 7 *Rattus rattus,* and 1 *Oryzomys flavescens.* Hocicudo stomachs contained 20% oligochetes, 60% arthropods, 5% other animals, 15% vegetation (mostly seeds and pollen), and traces of mice.

An 18-month (1968–1970) survey of the biology of the pampa rodents of the Balcarce area in Buenos Aires Province, Argentina, was made by Dalby (1975). His comparisons of life histories of *Oligoryzomys nigripes, Akodon azarae,* and *Oxymycterus rufus* (as "*O. rutilans*") with those of North American ecological equivalents were most informative. The hocicudo, Dalby noted, actually had no biological equivalent, but its habits coincided in many respects with those of the North American grasshopper mouse *Onychomys* and the shrew *Blarina.* Its biomass in the study area was highest, about 40% of all myomorphs captured. Mean and extreme weights in grams for scrotal males were 92.4 ± 1.56 (62–125) 82 samples; for perforate females, 76.2 ± 2.56 (46–110) 39. Sex ratio for trapping between 1 December 1968 and 30 April 1970, compared at 36 intervals, averaged 69.2% for females. Breeding occurred at all seasons, litters averaged 3.1 young, weaning 14 days, and sexual maturity 3 months. Survival rate for mice was high, 70–76% in summer, 92% in winter, contrasting with that of the Punta Lara *O. rufus.*

Dalby noted tail autotomy in *Oxymycterus,* a common event among rodents with loose-fitting tail skin or, as in spiny rats (Echimyidae) and other vertebrates, loose caudal vertebral joints. Many of the *Oxymycterus* I collected were indeed "bobbed." As a rule, the skinned, injured portion of the tail dries and becomes detached, or it may be bitten off by its owner.

Dalby found no burrows or runways attributable to the hocicudo, "contrary to its common name of burrowing mouse." In his opinion the "long foreclaws and shrew-like pointed nose function in digging and rooting for subsurface invertebrates."

In comparing an Argentine *Oxymycterus rufus* with the semi-aquatic *Scapteromys tumidus,* Mas-

soia and Fornes (1964a, p. 294) noted that the hocicudo swims only to survive. Submerged, its fur becomes completely soaked.

A female they captured had six embryos at term.

The type specimens of the Argentine *Oxymycterus akodontius* were two of five snap-trapped by E. Budin. The others, he said (in Thomas, 1921, p. 615), were eaten by rats, their skulls totally destroyed.

> When rats attack a dead specimen they always commence by eating the brain. One of these specimens was caught in a Tuco-tuco [*Ctenomys*] hole. I have observed both these animals dig their holes like the *Yeoxus* [*Geoxus*] of the south, making small hillocks of earth over them. The burrows are round and clearly visible. Hocicudos live in humid places among the hills, in the thickest parts of the woods.

These Budin notes were either garbled or misattributed. *Oxymycterus* has never been seen burrowing as alleged by Budin. Furthermore, sigmodontines that live, as reported by Budin, "in humid places . . . in the thickest parts of the woods" do not burrow.

Wied-Neuwied (1826) found the holotype of *Oxymycterus dasytrichus* along the Rio Mucurí in Bahia, Brazil. He also observed this mouse in the deep forest along the shore of Lago d'Arara. It seemed to live underground, he reported, but he could not determine whether or not it burrowed. Nowhere in eastern Brazil, he declared, "have I seen signs of burrows."

Burmeister (1854, p. 183) also thought *Oxymycterus rufus* was a burrower because its appearance suggested similarities with microtines.

Life history studies of the rodents of Uruguay by Barlow (1969) included *Oxymycterus nasutus* (his *O. rufus nasutus*), misnamed "burrowing mouse." Barlow found the hocicudo in such improbable burrowing resorts as

> wet meadows with stands of bunch grass (*Paspalum* sp.); tall grass adjacent to streams and rivers; and drier parts of marshy areas among clumps of pampas grass (*Cortaderia selloana*) outside the frequently inundated zone. Although taken in the same trapline with the hydrophilic *Scapteromys tumidus* and *Bolomys obscurus, O. rufus* [= *nasutus*] was most often taken in the slightly drier places frequented by *Oligoryzomys flavescens,* with which it was commonly associated.
>
> *O. rufus* [= *nasutus*] constructs no runways of its own but uses those of *Cavia pamparum,* the broad trails of *Hydrochoerus hydrochaeris* in stands of tall bunch grass, or natural pathways through such vegetation.
>
> Odour. An example caught in a live trap smelled strongly of an odour distinctly reminiscent of acrolein (acrylic aldehyde), a chemical used commercially to warn of leakage of toxic odourless gases from mechanical systems . . . . This acrid, penetrating scent may serve a similar warning function in these rodents, possibly serving to discourage potential predators.
>
> Food Habits. These mice are primarily entomophagous . . . . Glandular and structural modification of the stomach include a thickening of the fundus. This and other characters presumably associated with the entomophagous habit are shared with North American grasshopper mice (*Onychomys*) . . . . The contents of 12 stomachs analyzed in detail comprised invertebrated material, on the basis of the per cent of stomachs containing the item, as follows: Coleoptera (Tenebrionidae, Scarabaeidae, Lampyridae, Chrysomelidae, Carabidae, Pselaphidae, Dytiscidae) 100.0%; Hymenoptera (Formicidae) 83.3%; Diptera (Sciaridae, Bibionidae, Chironomidae, Tipalidae) 83.3%; Hemiptera (Timgidae, Pentatomidae) 41.6%; Orthoptera (Gryllidae, Acrididae, Gryllacrididae) 25.0%; Lepidoptera (Noctuidae, unidentified families) 25.5%; Homoptera (Cicadellidae, Fulgoridae) 16.6%; Oligochaeta (earthworms) 33.3%; Chilopoda (centipedes) 25.0%; Gatropoda (slugs) 16.6%; Aranea 16.6%; plants (unidentified fragments) 16.6%.
>
> In many marshy places *Scapteromys tumidus* and *Oxymycterus rufus* [= *nasutus*] are the principal insectivorous rodents. The two differ in microhabitat preferences and time of activity; *Oxymycterus rufus* [= *nasutus*] is primarily diurnal, although specimens have been trapped at dusk and in the early evening. Consequently competition with the nocturnal *Scapteromys tumidus* would probably be minimal.
>
> Breeding. Available data indicate that the breeding season of this mouse is protracted in Uruguay. Females were taken only in February, March, May, September and December but samples for each of these months included pregnant or lactating individuals. Likewise, males with scrotal testes of breeding size (9 × 6 mm and larger, as demonstrated by histologic analysis of testicular biopsies) were found in the above months. Seven gravid females averaged 2.1 (1–4) embryos ranging in length from 4 to 29 mm in length. One embryo was in the left uterine horn and three were in the right. Massoia and Fornes (1964, p. 294) reported a female with six embryos. *Oxymycterus rufus* [= *nasutus*] possesses eight nipples, and litters larger than those indicated by the embryo counts might be expected.

The only behavioral report of an Andean Division hocicudo (*Oxymycterus paramensis*) discounting that of Budin (above) is by Mares (1981, p. 181), as follows:

> This is one of the most shrew-like of the akodont rodents and inhabits the forest floor in mesic areas of north-central Salta. Some specimens were taken under logs in dense verdant second growth. One was taken from the sand-rock embankment of the Rio Pescado. This is an uncommon species in northeast Argentina and appears to be nocturnal. It probably is limited to the northern wet forests, although it possibly will be found in mesic forest enclosures in central, or even south-central Salta.
>
> Two individuals captured in September were not breeding—one had small abdominal testes, whereas the other had large (10.4 m length) inguinal testes.

Nothing in the above account would lead one to believe that *Oxymycterus paramensis* is a burrower or that its habitat is suitable for burrowing, yet Mare's account of the species is headed "hocicudo parameño-burrowing mouse."

REMARKS—In my short experience live-trapping the Brazilian *Oxymycterus rufus, O. roberti,* and one or two undescribed short-clawed species related to *O.*(?) *iheringi,* I saw no burrows or signs of any that may have been made or used by these sigmodontines. The long manual claws, seemingly burrowing tools, are used in foraging or for grappling subsurface organisms and tearing apart covered termite runways. Their mobile snouts aid in the search and probably for rooting.

Summary

The South American long-nose sigmodontines of the genus *Oxymycterus,* called hocicudos in Spanish and Portuguese, are small to medium-size terrestrial mice, with long front claws, tail shorter than head and body combined, a habitat preference for damp ground and tall grass, and a diet of mostly arthropods and molluscs. They are not natural climbers, swimmers, or burrowers.

Hocicudos are confined to the wide part of the continent between the south bank of the Rio Amazonas–Solimões–Marañón and north bank of the Río Paraná system, with the Atlantic Ocean on the east and the Andes on the west to about 4000 m above sea level. Demographically, *Oxymycterus* is one of the most speciose and populous of akodontines. It has no phylogenetic ties with sigmodontines to the north or south of its known range. The suggestion that *Podoxomys, Microxus, Lenoxus, Abrothrix,* and *Oxymycterus* formed a natural tribal group has been roundly rejected.

The 23 described hocicudos, the first in 1801 by Felix Azara, had never been organized into phylogenetic or geographic order. Material available in the Field Museum and some borrowed from other institutions, however, possessed the information necessary for the arrangement of *Oxymycterus* into two branching divisions, one Atlantic, the other Andean, the intervening separation filled by the Amazonian floodplain. Each division, in turn, consists of a number of species more or less comparable in size from small to large without overlap if all critical size dimensions are weighed together.

The northern and southern fluvial boundaries of the genus are not mere geographic barriers. They suggest historic markers that point to the possibility that *Oxymycterus,* if not all other complex penis type sigmodontines, are Patagonian (or Weddellian) in origin. In their northward spread (Fig. 2) hocicudos only now are infiltrating the Amazonian basin, which until Pleistocene time had been a huge freshwater lake.

The foregoing scenario is conjectural but perhaps less so than the presumption of a sigmodontine entry into South America from North America with no evidence of prior existence on that continent by the progenitor(s). Evidence of existence of South American descendants and their pathway to where differentiation of *Oxymycterus* took place is also lacking.

The phylogenetic and biogeographic data of South American sigmodontines, particularly akodontines, adduced by Smith and Patton (1993) from mitochondrial DNA with hypothetical paleontological assistance may have no support for my offhand proposition of a southern origin and northward spread. On the other hand, they do not justify their faith in a North American origin of complex penis type sigmodontines (as distinguished from neotomyini–peromiscini cricetids) and invasion of South America via the Panamanian route.

A third option for consideration in the possible origin of South American sigmodontines is the rafting of some of the basic stock from Africa, maybe in the Miocene (Hershkovitz, 1972, pp. 324, 354). The African origin of Neotropical caviomorph rodents and platyrrhine monkeys is relevant.

This paper is not a taxonomic revision of the genus *Oxymycterus.* It is a compilation and organization of mostly available information essential for the description of the new species of *Oxymycterus.* The organized data at the same time throw light on certain perhaps unsuspected aspects of sigmodontine origins, dispersal, and behavior.

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